JUMO

SENSORS + AUTOMATION

Issue 1/2020

Open fire

Sagas, science, sensors

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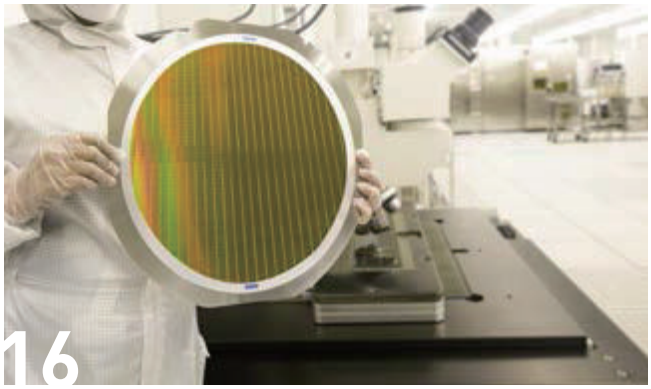

IN THE SPOTLIGHT_주목할 점

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ABOUT US

Dear Reader,

The current customer magazine is "hot stuff" in the literal sense because, this time, we chose the title "Fire". As a follow-up to the previous issue ("Water"), we are also placing the focus of the magazine on an element.

And with good reason: as sensor specialists, we certainly feel at home in all the elements, but temperature has always been particularly special to us. Company founder Moritz Kurt Juchheim began the JUMO success story with glass thermometers over 70 years ago. Even today, temperature measurement technology continues to be our most important pillar, ranging from platinum thin-film sensors to complete automation solutions.

Temperature remains one of the key measurands in many industrial applications, including the interconnected Industry 4.0 realm. As a result, our development team of physicists and design engineers is constantly working to successfully bring this significant measurand into the digital era with new products and technologies. The best example here is JUMO plastoSENS technology, which allows us to manufacture temperature sensors with high-performance plastics in an injection molding process.

JUMO has more important news: in this editorial, we are happy to send our greetings as a team of three for the first time. We cordially welcome Dimitrios Charisiadis as an additional Chief Executive Officer. Read more on page 27 of this issue.
We hope you enjoy reading our magazine.

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

Dimitrios Charisiadis
Chief Executive Officer


*Fire in itself is neither good nor evil.
When it cooks a meal for you, you
bless the fire and say "How good it is!"
And when it burns your finger, you say
"What a nuisance it is!"*
(Indian proverb)

Open fire_불:양면적인관계
Sagas, science, sensors

Humanity has always had an ambivalent relationship with fire. It guided us through dark nights, warmed our food, and allowed us to manufacture tools. On the other hand, it has injured us and has burned our belongings time and again. But what is fire, really?

인류는 항상 불과 양면적인 관계를 맺어왔습니다. 불은 어두운 밤을 안내하고, 음식을 따뜻하게 하고, 도구를 만들 수 있게 해주었습니다. 반면에 우리를 다치게 했고, 소유물들을 태워버렸습니다. 불이란 무엇일까요?

The universe – it all started with a big bang!

Around 13.8 billion years ago, things got hot – very hot. The event known as the "big bang" marked the beginning of the universe as we know it today. One singularity generated matter, space, and time. Many theories surround this event, but it is widely accepted that the first hundredth of a second after the big bang, temperatures of around 100 billion degrees Celsius seared the universe. 3 to 4 minutes later, the temperature had already cooled to "just" 900 million degrees Celsius. →

Fire is a good servant, but a bad master!

(German proverb)

Today the empty space of the universe is a frigid place with a temperature of -270 degrees Celsius. This is why proximity to the sun is absolutely necessary for humanity's survival. Temperatures of over 5 000 degrees Celsius prevail on the surface of this gas sphere consisting of helium and hydrogen. The sun is expected to continue providing warmth for another 5 billion years.

Humanity – always fire and flame

Human evolution is closely linked to fire. The heat that fire provided was not the only significant aspect. Fire also provided protection from wild animals and the opportunity to heat and therefore store food. Traces of burned bones and parts of plants in a South African cave indicate that Homo erectus already began using fire over a million years ago. The oldest lighter is supposedly nearly 800 000 years old as the earliest flint stone discovered comes from that the time period. The first iron ore and copper mines are over 5 000 years old.

The history of fire is often shaped by myths and fairytales. According to the ancient Greeks, the Titan Prometheus gave humanity fire after stealing it from Zeus, the father of the gods. Nordic mythology tells tales of the fiery region of Muspelheim. It is also impossible to think of Christianity's hell without fire.

The earliest scientific discussion of fire also took place in ancient Greece. According to the theory of Four Elements, water, air, fire, and earth are eternal and unchangeable basic elements which form the variety of substances through mixing. This belief continued to prevail long into the Middle Ages.

Even in our seemingly enlightened era we are still mystifyingly intrigued by fire. Whether celebrating solstice, sitting around a cozy fireplace, or enjoying New Year's celebrations – fire represents security and fellowship.

The chemistry – facts instead of flames

Our current chemical and physical perspective began to develop during the Age of Enlightenment. Researchers recognized that fire is an oxidation process during which combustion takes place. A chemical reaction is the cause. During this reaction, substances known as "oxidizing agents" absorb electrons from another element. The result of this exothermic reaction is heat and visible light.

The emissions on the visible spectrum, which we see as light, are also the result of energy conversion.

The heat of the fire provides energy to the individual atoms (ions) in a burning gas. As a result, the electrons that circle the nucleus jump to a new, higher energy level. After a brief period, the electrons fall back to the lower level and emit the additional energy again – but now as light instead of heat.

The flame of a candle normally reaches up to 1 400 degrees Celsius. The highest measurable flame temperature under ideal conditions is around 6 000 degrees Celsius. That is more than twice as hot as the optimum combustion of natural gas. These sorts of extreme temperatures occur when the molecules dicyanoacetylene and ozone react with each other under the enormous pressure of 40 bar.

The physics – air, water, mercury, platinum?

People have always wanted to measure things to gain understanding. Fire is no exception, of course. Today, temperature is the second-most common measured measurand right after time. As early as the second century, an air thermometer was developed in Byzantium. Its operating principle was based on the fact that air expands with heat and contracts with cold.

In 1592 Galileo Galilei developed the first usable thermoscope. The temperature was read off a water column, which changed its level depending on the temperature. But the thermometer began to provide the first real benefits once a temperature scale was developed that had 2 defined fixed points.

However, the 35 scales used in the 18th century were not uniform. Daniel Gabriel Fahrenheit was the first to introduce a standard that we know as the Fahrenheit measuring unit today. Soon mercury was used instead of water because it expanded more uniformly. Swedish astronomer Anders Celsius developed a temperature scale in 1742 that only had 2 fixed points – the freezing point and boiling point of water.

But why does the temperature scale actually start at zero? Ultimately, temperature is nothing more than the movement of particles. If nothing moves, we say it is 0 Kelvin.

However, the era of liquid-filled thermometers is slowly but surely coming to an end. In industrial sectors today, platinum thin-film sensors or thermocouples are used to measure temperature. In the private sector electronic products are also becoming increasingly more common than the traditional glass tubes. ■

JUMO
The measure of all things_모든것들을 측정하다.

JUMO의 온도측정은 1948년부터 시작되었습니다. JUMO는 수십 년 동안 열량계용 온도측정기 분야에서 세계 시장을 선도해왔습니다. 회사 설립자인 Moritz Kurt Juchheim은 6명의 직원과 함께 독일 풀다에서 유리 온도계 제조를 시작하였습니다. 오늘날 JUMO 온도제품의 포트폴리오는 배기가스 온도모니터에서 다이얼 온도계에 이르는 광범위한 스펙트럼으로 구성되어 있습니다. 백금박막센서(온도소자)와 RTD온도프로브는 빌딩기술의 룸온도 측정부터 산업용로의 높은 온도측정까지 다양한 분야에 성공적으로 적용되고 있습니다. 오늘날 JUMO의 온도 측정기술을 찾을 수 없는 산업은 거의 없을 정도로 매우 널리 적용되고 있습니다.

JUMO innovations

Products that make life easier

_우리의 일상을 편리하게 해주는 제품들

1 Sensor for digital optical oxygen measurement
JUMO digiLine O-DO S10
_광학식 산소측정을 위한 디지털 센서

The latest optical technology in fluorescence quenching and digital signal processing enables the sensor to conduct oxygen and temperature measurements in the measurement medium with long-term stability. The sensor housing is made from PVC so that the JUMO digiLine O-DO S10 can be used in both fresh and salt water. Possible application areas for the sensor include fish breeding applications, sewage treatment plants, and other areas of water and wastewater engineering.

Using the innovative, user-friendly connection concept from the JUMO digiLine bus system the sensor can be easily and quickly connected to the digiLine master via Plug and Play. The modern data management system that is integrated in the sensor is also innovative. This system acquires and logs relevant operating data over the sensor's entire lifecycle to optimize processes and procedures. This includes the acquisition of operating hours as well as functions designed to enable predictive maintenance such as early notifications when calibration work is required or a sensor cap needs to be replaced. An RS485 Modbus RTU interface and an analog output (4 to 20 mA) enable easy integration of the system with field devices and process control systems.

2 New multifunctional four-wire transmitter JUMO dTRANS T06 Ex
_SIL,방폭어플리케이션을 위한 새로운 멀티기능 4-wire 트랜스미터

The new JUMO dTRANS T06 Ex multifunction four-wire transmitter in a mounting rail case is suitable for use in challenging SIL and Ex applications. Its measurement input features 22-bit resolution with selectable noise suppression and is extremely precise. The SIL option fulfills the requirements of SIL 2/SIL 3 according to DIN EN 61508 and PL c/PL d according to DIN EN ISO 13849. JUMO dTRANS T06 Ex also meets the ATEX and IECEx requirements up to zone 0. A particularly high galvanic isolation guarantees the highest degree of reliability. Intuitive operation takes place via 4 keys and an LCD, which can also be used to display information about the measuring point. A special setup program was developed to ensure easy SIL configuration. As a special feature, the device display can also be used to access a connection diagram that is based on the configuration. The compact mounting rail case and the encoded plug-in terminals enable the device to be quickly installed into control cabinets. In addition, the device can be reliably replaced when performing calibration and maintenance work. The universal input can process a variety of sensor or standard signals. All the important information regarding the transmitter can be queried and visualized via an RS485 interface.

3 Screw-in RTD temperature probe JUMO MarineTemp
_선박산업을 위한 BV인증 RTD온도센서

The JUMO MarineTemp screw-in RTD temperature probe is certified by Bureau Veritas. It is the preferred choice for temperature measurement in liquid and gas media in shipping. Here, a decisive criterion is the reliable sealing feature when vacuum and overpressure occurs. The thermometer is available with a two-wire or four-wire circuit for temperature ranges between -50 and +400 degrees Celsius. The intelligent design of the RTD temperature probe with a fixed measuring insert allows temperatures to be measured under standard conditions. The terminal head (form B or BUZ) is suitable for ambient temperatures between -40 and +100 degrees Celsius. Per default, a Pt100 temperature sensor according to DIN EN 60751, class B in a two-wire circuit is installed in the measuring insert. Versions of class A or AA are also possible. Versions with a remote protection tube are available for quicker response times. A transmitter with an operating temperature range from -40 to +85 degrees Celsius can be integrated into the terminal head as an optional extra. ■

Systematic silo temperature monitoring

Reliable storage of grain

_신뢰성있는 곡물보관을 위한 체계적인 사일로 온도모니터링

독일에서는 연간 4천 5백만 미터톤의 곡물이 수확됩니다. 온도는 수분함량 외에도 보관 중 품질을 보장하기 위해 사용되는 가장 중요한 측정량 중 하나입니다. 가장 많이 판매되는 곡물은 밀로 전체 수확량의 거의 절반을 차지합니다. 곡물의 상당 부분은 추후 가공될 때까지 저장됩니다. 수확 직전인 6월에도 사일로(큰 탑 모양의 곡식 저장고)와 같은 저장 시설에서 최대 800만 미터톤의 곡물이 보관됩니다. 곡물을 저장할 때는 수많은 매개변수를 고려해야 합니다. 곡물을 저장할 수 있을 때까지 건조 및 환기하는 것은 물론 곰팡이로부터 곰팡이 균(mycotoxin)형성을 방지하는 것도 이에 포함됩니다. 곡물의 수분 함량이 너무 높으면 온도를 상승 시켜 발아가 시작됩니다. ➔

High temperatures and increased water content lead to massive respiratory and quality losses.

고온과 수분함량의 증가는 대규모 곡물 호흡 손실 및 품질 손실로 이어집니다!

곡물의 호흡손실은 곡물 알갱이를 감소시킬 뿐만 아니라 사일로의 습도를 증가 시켜 해충과 곰팡이 침입을 증가시킵니다. 해충 침입은 지속적인 온도 모니터링을 통해 감지할 수 있습니다. 무엇보다도 저장 온도에 도달한 후의 온도상승은 곡물바구미 (곤충의 한 종류)의 침입에 대한 신호입니다. 다른 곡물과는 달리, 맥주맥(맥주 원료로 쓰이는 두줄보리)의 발아 용량과 발아 에너지는 매우 중요한 항목 입니다. 이 과정에서 충분한 환기가 필요하고 온도모니터링이 중요한 역할을 합니다.

따라서 실제 생산 장비 외에 적용된 모든 측정 장치도 ATEX 지침에 따라 제작할 필요가 있습니다. 대부분의 경우 사일로의 머리 부분은 방폭 ZONE 20으로 분류되는데, 이는 대기 중 가연성 먼지구름 형태의 폭발 가능성이 있는 대기층이 장기간 지속하는 구역입니다.

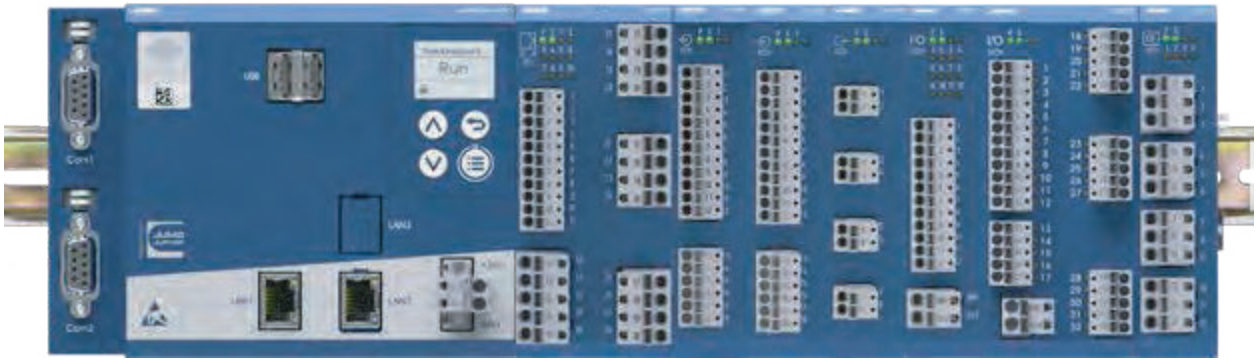
Uninterrupted temperature monitoring_연속적인 온도모니터링

온도모니터링데이터의 시각화와 보관뿐만 아니라, 품질을 유지하고 제품을 보장하는 저장 프로세스를 문서화 할 수 있습니다. 이를 위해 JUMO는 ATEX 인증한 특수한 멀티포인트 온도측정기를 제품 포트폴리오에 추가하여 곡물 사일로의 다양한 높이에 적용할 수 있습니다.

곡물 사일로는 함유된 먼지로 인해 잠재적으로 폭발성이 있는 지역으로 간주되기 때문에 ATEX인증이 필요합니다. 곡물 처리 과정에서 입자 접착, 곡물 마모의 형태 또는 곱게 갈린 곡물가루의 분진이 불가피하게 축적됩니다. 이러한 먼지가 휘저어지면 폭발 가능성이 있는 대기를 조성하게 되는데, 어떠한 상황에서도 발화해서는 안 됩니다.

Probes with up to 50 meters length _최대 50m길이의 프로브

JUMO 사일로센서는 금속 구조물 또는 콘크리트 패널에 고정될 수 있습니다. 보호등급 IP6X의 알루미늄 또는 스테인리스강 연결 하우징은 사일로가 가득 차 있을 때 부품 교체를 용이하게 합니다. 프로브에서 Pt100 또는 Pt1000온도센서는 DIN EN 60751에 따른 높은 정확도와 측정 반복성을 보장합니다. ➔

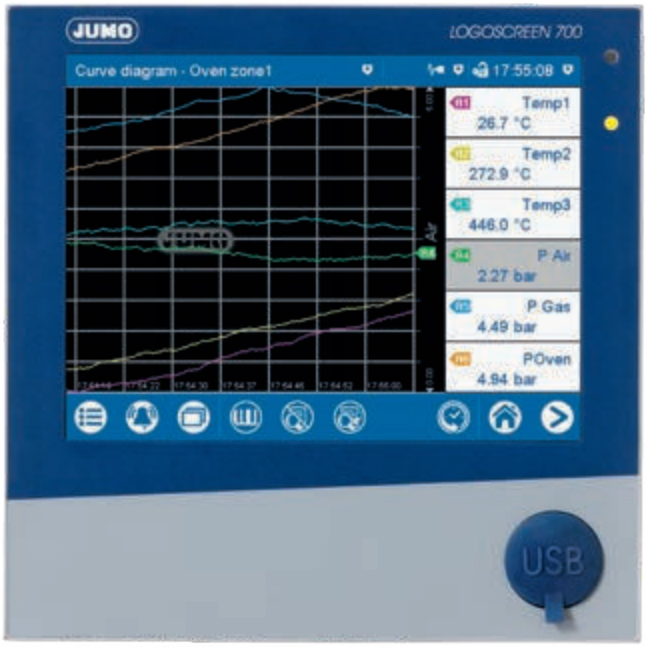


다양한 측정지점은 프로브튜브의 총 길이 50m에 걸쳐 고르게 분포할 수 있습니다. 또한 JUMO는 데이터를 획득하고 평가하는데 적합한 기술을 제공합니다. 각 요구사항에 맞는 다양한 2-wire 트랜스미터부터 JUMO LOGOSCREEN700과 같은 디지털기록계 및 JUMO variTRON시스템을 적용하여 구현할 수 있는 완전한 자동화 솔루션에 이르기까지 다양한 기술적용이 가능합니다. JUMO Device App을 통해 스마트 폰으로 장소, 시간과 관계없이 기록된 데이터에 대한 모바일 접속도 가능합니다. USB플래시드라이브를 통해 설정 데이터를 전송할 수 있습니다.

Mobile access to the recorded data is also possible at any time via smartphone.

The JUMO Device App

JUMO Device App은 사용자에게 항상 프로세스데이터에 대한 모바일 접속을 제공합니다. 이더넷을 통해 네트워크로 연결된 JUMO 장치의 알람 및 이벤트 목록뿐만 아니라, 현재 모든 프로세스값을 텍스트 형태로 확인 할 수 있습니다.



Worth knowing

Per-capita consumption of grain in Germany is nearly 80 kilograms. The majority of the grain is in the form of baked goods. In addition to food, grain is also used for animal feed, energy production, and industrial purposes. Globally, an average of 20 percent of produced grain is used as feed. In the EU, that average is 45 percent and, in Germany, it is over 50 percent. Energy-related use in Germany is less than 10 percent of the domestic consumption of grain.

Level measurement in diesel tanks

The right medium in the storage tank?_디젤탱크의 레벨측정

독일연방 통계청에 따르면, 2016년부터 2019년까지 최종소비자용 디젤 평균가격이 약 18%이상 증가했습니다. 주유소 운영자는 수익성을 높이기 위해 연료 저장에 대해 전향적으로 생각해야 합니다. 그럼에도 불구하고 실제적 위험은 정상적인 연료주입 중에 차량의 연료탱크에 물이 유입되는 것입니다. JUMO의 수준 높은 시스템이 이 문제를 해결할 수 있습니다. 주유소의 연료 펌프에서 물과 디젤의 혼합물이 나오는 것이 어떻게 가능할까요? 최근 몇 년 동안 지하의 디젤이나 가솔린 탱크에 물이 침투하여 오염되는 경우가 반복되고 있는데, 특히나 비가 많이 오는 기간에는 더욱 문제가 많이 발생합니다. ➔

Float switches and level transmitters with floats are now part of the JUMO product portfolio.

2개의 유체가 혼합되지 않고 일정량의 디젤이 분사시스템에 남아있기 때문에 엔진은 잠시 동안 가동될 수 있습니다. 하지만, 이 차량의 운전자는 멀리 가지 못할 것입니다. 물이 탱크 바닥까지 가라앉아서 펌프를 통해 먼저 흡입되기 때문입니다. 이로 인해 상당한 손상이 발생할 수 있습니다. 이 경우, 전체 연료 시스템을 청소하고 필터를 교체해야 합니다.

Innovative combined solution
_혁신적인 결합 솔루션

이러한 문제를 방지하기 위해, 디젤탱크시스템 제조업체가 JUMO에 의뢰해 전반적인 솔루션을 찾아냈습니다. 디젤 탱크에서는 연료 리필 메세지가 전송되고 펌프 제어가 구현될 수 있도록 레벨을 연속적으로 측정해야 합니다. 동시에 가능한 수분 침투 여부를 감지하기 위해 포인트 레벨측정을 사용해야 합니다. 우리는 NESOS 제품조합을 기반으로 솔루션을 구현하였습니다. 플로트스위치와 레벨트랜스미터를 하나의 제품으로 통합하여 탱크 개방을 통해서만 설치가 가능하도록 하였습니다.

또한 이 제품군들은 잠재적으로 폭발 가능성이 있는 지역에 필요한 승인을 받았습니다. 플로트스위치는 물과 디젤 연료의 변화되는 밀도 측정에 적용될 수 있습니다. 플로트는 물과 디젤의 접점에 떠다니도록 설계되어 있으며, 그 결과는 알람메세지로 확인 가능합니다. JUMO NESO복합센서는 전체 길이가 4m이상인 디젤탱크에 적용되도록 특별히 설계되었습니다. JUMO 레벨측정을 통해 고객은 실제 디젤 레벨과 평균 소비량을 파악할 수 있어 수요에 대한 선제적이고 경제적인 계획 수립에 도움이 됩니다.

JUMO포인트 레벨측정을 위한 JUMO NESOS플로트스위치는 -52 °C에서 최대 +240°C의 온도 범위 내에서 사용할 수 있으며, ±2mm의 높은 스위칭 포인트 정확도를 가집니다. 스위칭 동작은 접촉이 없어 마모가 없으며 추가적인 보조에너지(전원)이 필요하지 않습니다. 옵션 사양으로 Pt100 또는 Pt1000온도센서 및 온도스위치와 함께 사용할 수 있는 버젼이 있습니다. 또한 JUMO NESOS 레벨 측정트랜스미터는 -52°C에서 최대 +180°C의 온도범위 내에서 사용할 수 있으며 4-20mA의 연속 출력을 제공합니다. 최대 편차는 5.5mm입니다. 온도스위치, 온도트랜스미터, 디스플레이뿐만 아니라 Pt100 또는 Pt1000 온도센서가 장착된 버젼도 옵션으로 적용할 수 있습니다.

Automation system for plant control

_플랜트제어를 위한 자동화시스템

JUMO mTRON T은 모듈식 측정, 제어 및 자동화시스템으로 완벽한 플랜트 제어를 구현할 수 있습니다. 모듈식 구성요소의 개념은 가변 I/O모듈을 강력한 제어 패널과 결합합니다. 복잡한 제어작업과 정교한 자동화솔루션을 위한 JUMO mTRON T는 측정값의 기록 부분에서도 매우 인상적입니다. 광범위한 입력 변수에 대한 범용 아날로그 입력과 수년간 입증된 고품질의 JUMO제어 알고리즘은 높은 수준의 공정 신뢰성과 가능한 최대의 투명성을 보장합니다. 디지털 입력모듈은 필요한 온라인 알람에 사용됩니다. 이에 따라 스마트폰 또는 이메일을 통해 필요한 정보를 받을 수 있습니다. JUMO diraVIEW 디지털인디게이터는 탱크의 오작동을 직접 알려줍니다. diraVIEW 시리즈는 analog(아날로그) 입력 1개, binary (바이너리) 입력 2개, relay(릴레이) 출력 2개, logic(로직) 출력 2개, 2-wire 트랜스미터용 전압 공급장치를 기본으로 제공합니다. 최대 2개의 확장 슬롯은 인터페이스 뿐만 아니라 추가 입력과 추가 출력을 장착할 수 있습니다. 알람 텍스트의 색상이 녹색에서 빨간색으로 바뀌기 때문에 특히 눈에 잘 띄는 장점을 가지고 있습니다. ■

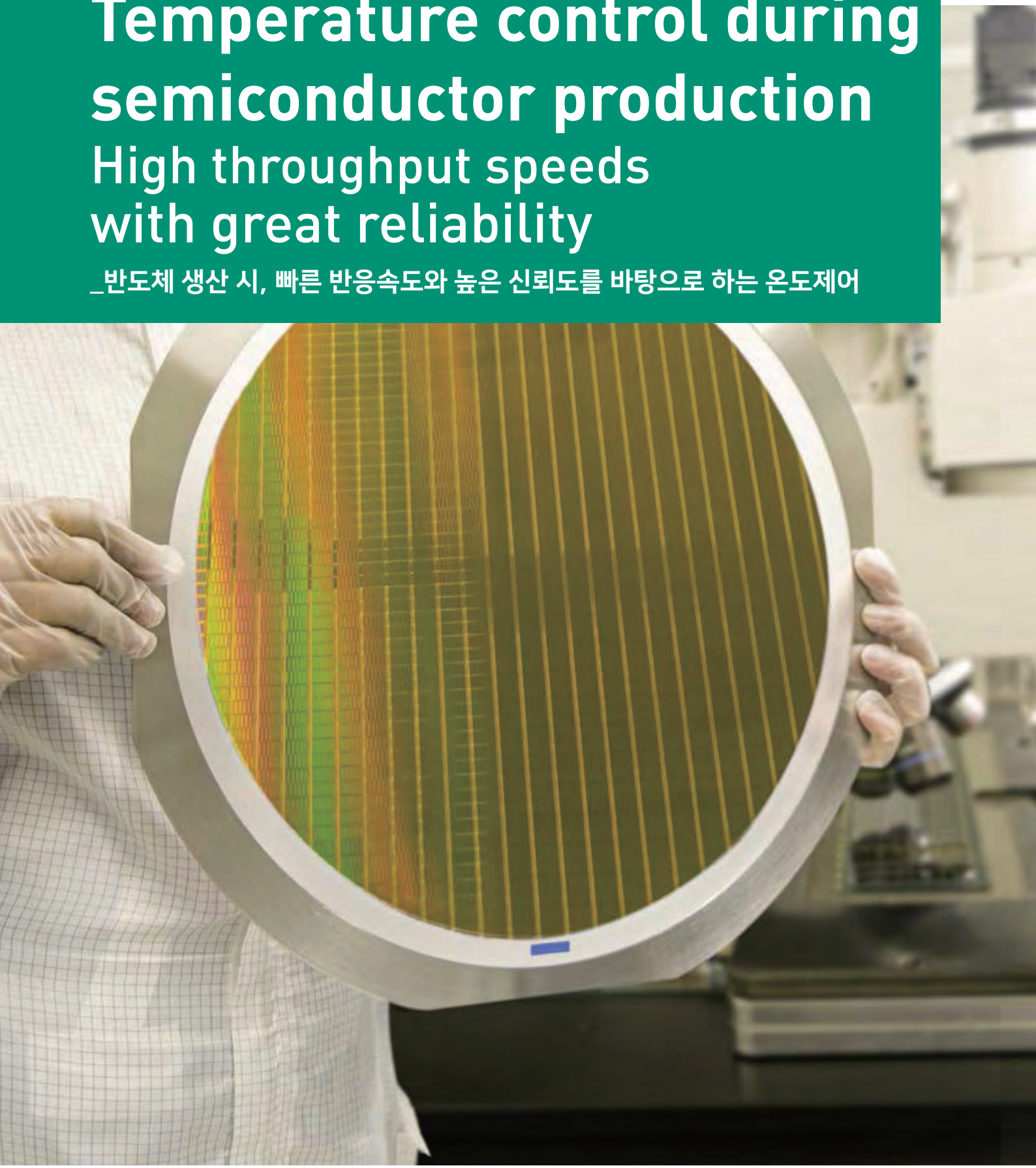
Good to know

The ignition temperature of diesel fuel is between 200 and 350 degrees Celsius. Gasoline ignites at a temperature between 220 and 460 degrees Celsius. In Germany, around 15 million cars with diesel engines are on the road.

Temperature control during semiconductor production

High throughput speeds with great reliability

_반도체 생산 시, 빠른 반응속도와 높은 신뢰도를 바탕으로 하는 온도제어



ASM기업의 분사인 네덜란스 회사 레비텍(Levitech)은 반도체산업을 위한 기계를 생산합니다. 반도체 시장이 요구하는 더 작은 구조와 더 큰 균일성을 달성하기 위해 기계제조업체는 새로운 열전달 방법을 구현해야 했습니다. 이를 위해서는 더 빠른 온도 보정이 요구되며 무엇보다도 더 정밀한 제어가 필요합니다. 따라서 레비텍은 레비터 기계에서 열과정을 제어하는 대안을 찾았습니다. JUMO는 네덜란드의 Almere사와 함께 이 솔루션이 구현될 수 있게 하였습니다.

Faster temperature correction and accurate control in particular are essential to this process.

이 시스템은 웨이퍼가 매번 동일한 최적의 온도에서 생성될 수 있도록 합니다. ■

The manufacturing process _제조공정

웨이퍼 제조를 위한 원자로는 2개의 흑연디스크로 구성되며, 이 흑연디스크는 2개의 디스크로 가열됩니다. 적정 공정 온도 최적화를 얻기 위해 디스크는 특정 기능을 보여야 합니다. 이 과정에서 가스는 웨이퍼가 두 디스크 사이를 건드리지 않고 맴돌게 하는데 사용됩니다. 필요한 온도인 1200°C에 도달하기 위해 특수 Kanthal® 히팅 소자가 적용됩니다.

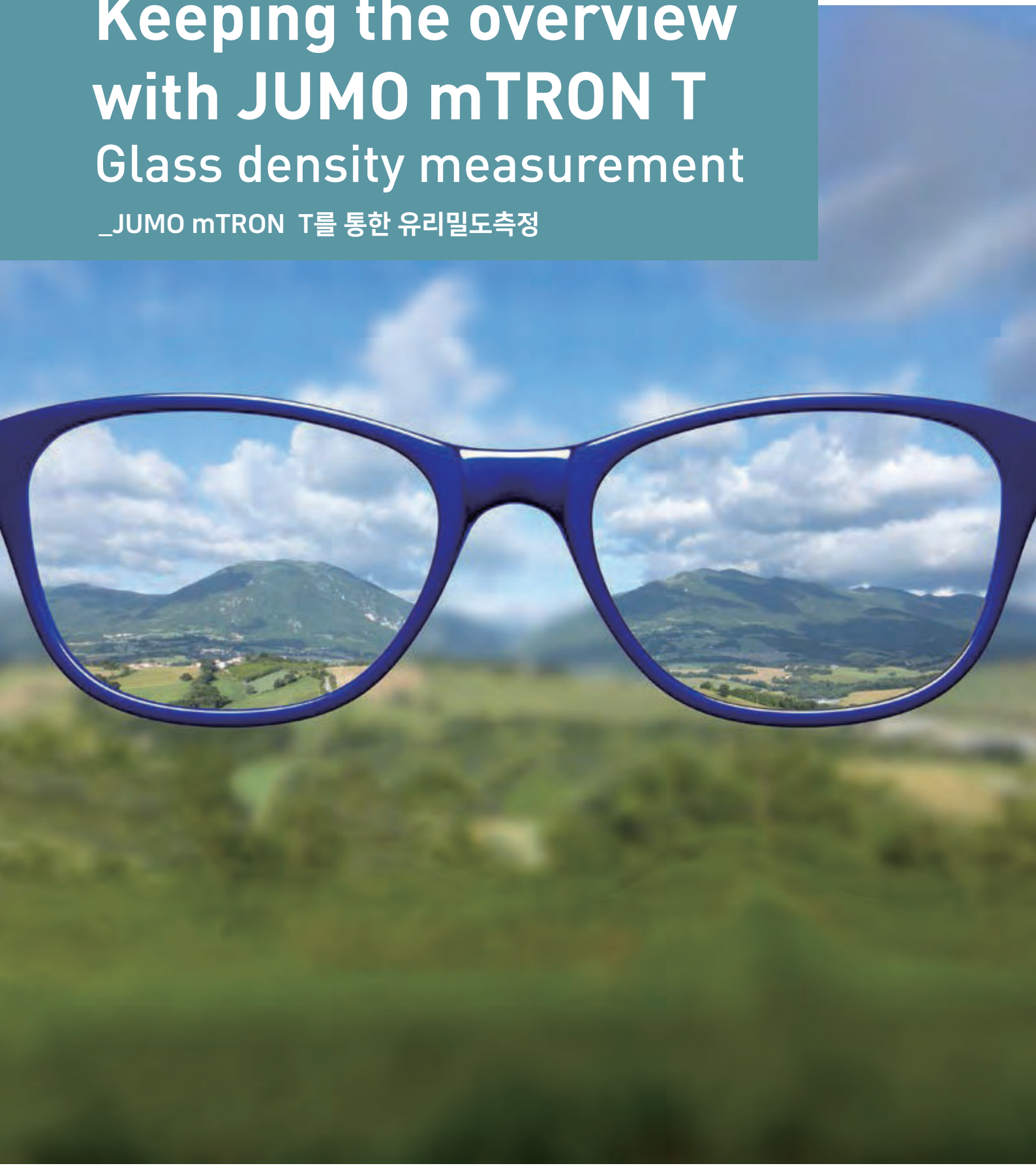
Higher efficiency_고효율

열전달에 혁신적인 방법을 적용하면 웨이퍼를 매우 빠르게 가열할 수 있고, 매우 빠르게 냉각할 수 있습니다. 웨어퍼의 양쪽은 0.15mm의 균일한 개구부가 있어 열전도율이 매우 높습니다. 웨어퍼가 몇 초 이내에 흑연디스크의 온도로 가열됩니다. 이것은 특정 난방제어시스템으로 제어됩니다. 여기에 사이리스터가 설치되어 이 기능을 수행합니다. JUMO TYA 201사이리스터는 모든 온도 단계에서 Kanthal® 히팅소자의 필요한 전류와 전압을 제어하여 프로세스 중 정확한 온도 진행을 보장합니다.

Keeping the overview with JUMO mTRON T

Glass density measurement

_JUMO mTRON T를 통한 유리밀도측정



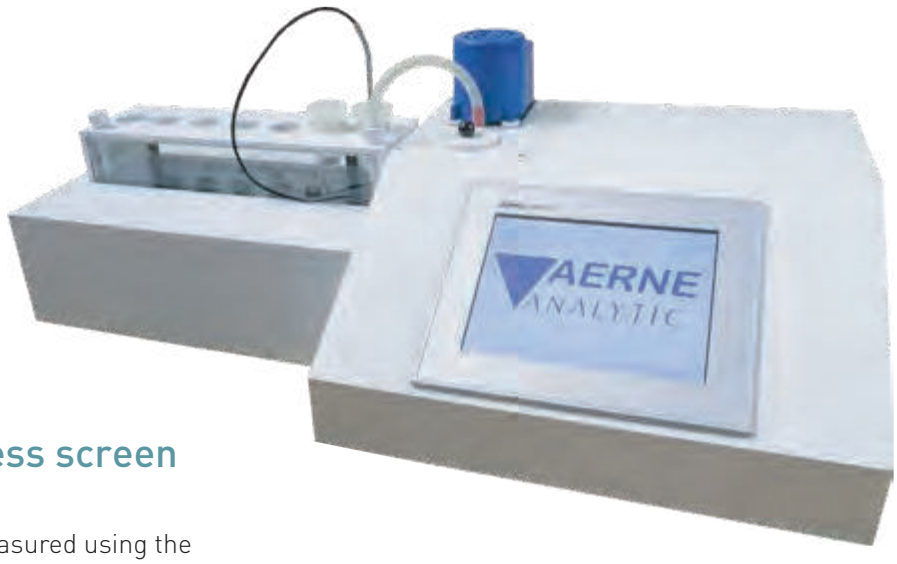
Density is an important quality characteristic in glass manufacturing.

밀도는 유리 제조에서 중요한 품질 특성입니다.

Glass is a material with very special features. Instead of a melting point, it has a transformation range. When within that range, it slowly becomes softer and then melts. Glass is available in many different types with different compositions, which is why some properties of the material are variable.

Numerous parameters must be monitored during the complex production process. Together with the JUMO Engineering Team, Aerne Analytic e. K., a specialist manufacturer of laboratory equipment, has now developed a measuring device that facilitates fully automatic measurement of density.

Because this type of measuring process takes approximately 1 to 2 hours, significant improvements to the process can result from automation. Moreover, it is possible to perform 6 measurements at once. The technical solution was implemented using the JUMO mTRON T automation system.



Clearly arranged process screen
_공정스크린의 명확한 배열

The density of glass samples is measured using the sink-float method developed by M. A. Knight. This means that each of the 6 test jars is filled with 2 glass specimens and 1 additional reference sample. The density of the reference samples is entered into the JUMO mTRON T multifunction panel's clearly arranged process screen. The test jars are filled with a test liquid consisting of a mixture of bromine naphtalene or tetrabromoethane. This liquid is heated indirectly in a water bath with distilled water.

The density of the test liquid must be greater than the density of the glass body when the measurement process begins. This causes the glass to float on the surface. When the measuring process begins, the bath temperature is slowly increased. This naturally also increases the temperature of the test liquid. Its density decreases as the temperature rises. The result is that the glass samples sink quickly or slowly, depending on their own density.

After a certain amount of time, the glass bodies are passed through a light gate that automatically recognizes whether the tested object is the reference sample or the glass sample. The density of the glass samples is calculated and displayed depending on the various temperatures when they pass through the light gate as well as the associated times.

Extreme high degree of measuring accuracy
_매우 높은 수준의 측정정확도

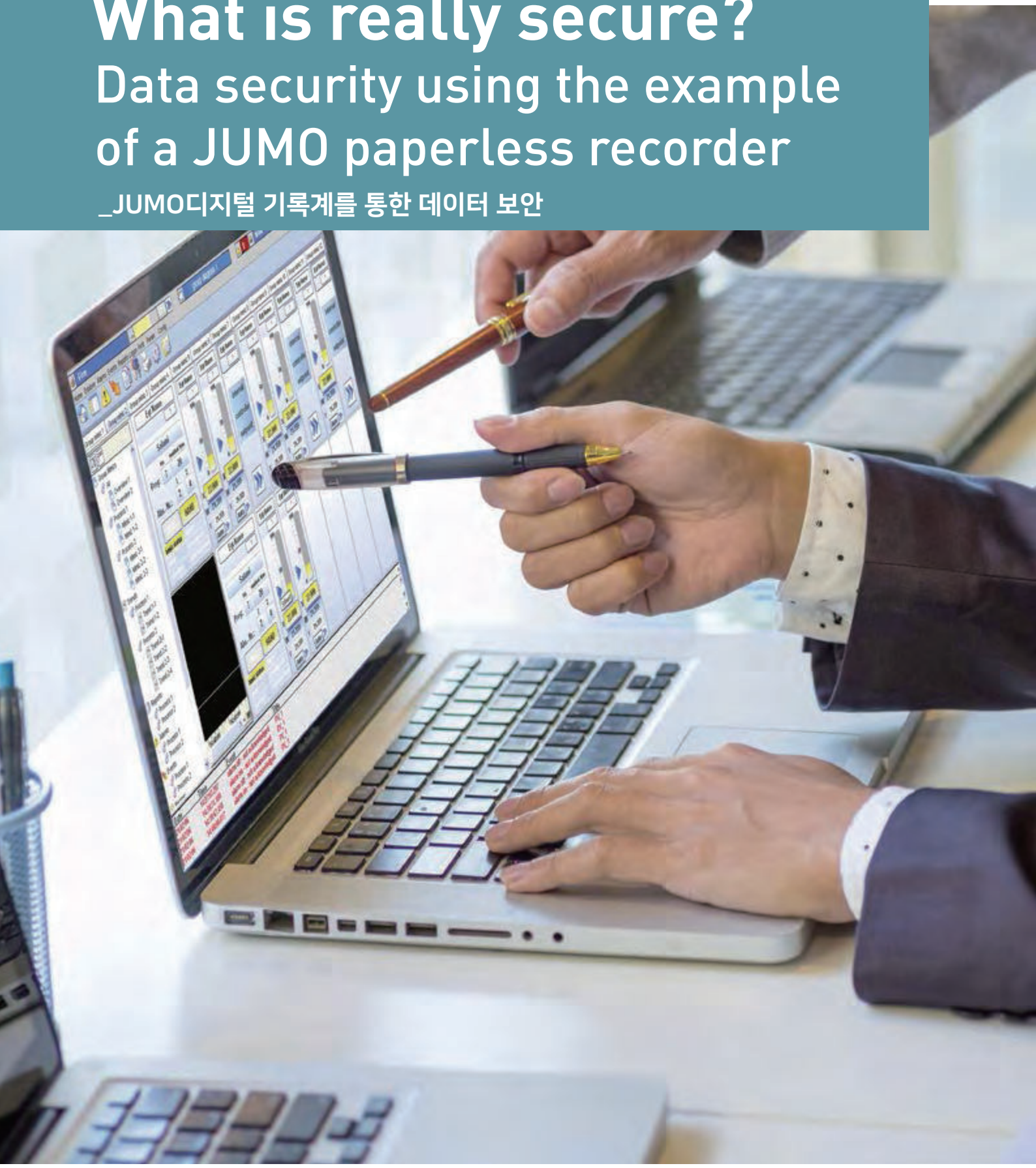
To achieve the required measuring accuracy of ±0.0002 grams per cubic centimeter, extremely precise hardware must be used. JUMO RTD temperature probes from the class A category and the highly precise, galvanically isolated JUMO mTRON T four-channel analog input modules make this possible.

Measurement data can be extracted from the JUMO mTRON T multifunction panel using a USB flash drive or Ethernet interface. The JUMO PCA 3000/PCC software package is used to evaluate and visualize the measurement data and results. The form functionality is used to automatically generate a customizable test report. It can be saved as a PDF file or immediately printed out and signed. ■

What is really secure?

Data security using the example of a JUMO paperless recorder

_JUMO디지털 기록계를 통한 데이터 보안



The amount of data generated globally increases by nearly 30 percent every year.

세계적으로 생성되는 데이터 양은 매년 거의 30%씩 증가합니다.

The topic of "data security" is more relevant than ever. For example, production processes in the pharmaceutical or food industries need to be seamlessly documented to rule out any manipulation. This is the only way to ensure consistently high product quality.

How can companies effectively protect themselves in the age of increasing digitalization? JUMO has also dealt with this topic over and over again as we manufacture measurement and control technology such as recorders.

JUMO introduced the first paper recorder to the market as early as 1964. The need for devices to be tamper-proof was not an issue back then because any interference would be easy to see on the printed strips of paper. That changed with the first paperless recorders. The measured values they recorded were no longer documented on paper. Instead, they were saved as data on a hard disk drive or another storage medium – it is a known fact that data can be manipulated on such devices.

FDA compliant paperless recorder
_FDA규정에 따른 디지털기록계

Ensuring that data is tamper-proof plays a central role for the JUMO LOGOSCREEN 700 because the recorder facilitates FDA-compliant data recording. The Food and Drug Administration (FDA) created requirements for electronic recording and signatures in the Code of Federal Regulations, 21 CFR Part 11. These rules apply when information is electronically generated, changed, saved, and transferred or if this information needs to be accessed.

Taking a look at the "signatures" issue shows how meticulously the FDA approaches these issues. Among other things a digital signature must include the name of the signatory, the date and time, as well as the meaning of the signature. This signature must be forgery-proof and it must be connected to the document in such a way that it cannot be applied to other documents. Moreover, it must be possible to assign them to 1 single individual and consist of 2 components such as an identification code and a password.

TÜV-approved security
_ TÜV인증된 보안

The JUMO LOGOSCREEN 700 can do all of these things. A special extra code gives the device a TÜV-approved function for ensuring data security. A digital device certificate provides proof that the recording data has not been manipulated in the device, during transfer, or during evaluation.

Additionally, the PC security manager software allows for administration of up to 50 users per device. An electronic signature can be assigned to a batch report, a time range, or for logging off. Issuing authenticated commentaries on the device highlights the flexibility when recording processes that require verification. The use of a digital certificate ensures secure manipulation detection here as well. ■

Compact knowledge

Temperature_온도에 대한 간단한 지식

Water boils at 100 degrees Celsius ...

... but only at sea level. The boiling point at the top of Mount Everest is approximately 70 degrees Celsius. Hot water reaches temperatures of up to 400 degrees Celsius as it streams from hydrothermal vents on the ocean floor.

Cool on the go

The ideal temperature for driving a car is 24 degrees Celsius. Our ability to concentrate begins to wane after that point.

Delicious and affordable

The temperature in a pressure cooker is around 117 degrees Celsius. This saves at least 50 percent time and energy when cooking the food.

The hottest place in the world is Death Valley in the United States

In 1913, 56.7 degrees Celsius were measured there in July. In one Iranian desert, temperatures supposedly reach up to 70 degrees Celsius, although this has not been verified. In comparison: temperatures on Venus can reach up to 500 degrees Celsius.

The highest melting point of all the elements

in the periodic table is wolfram at 5 900 degrees Celsius. Helium has the lowest melting point at -270 degrees Celsius.

People are extremely sensitive to fever or hypothermia

Protein in the body begins to coagulate at a temperature of 42.6 degrees Celsius which causes a life-threatening situation. It is also dangerous when the body temperature falls below 35 degrees Celsius because that can lead to life-threatening cardiac arrhythmia.

5 facts about industrial furnace construction

_산업용로 건설에 대한 5가지 사실

JUMO Market Segment Manager
Industrial Furnace Construction
Christoph Bollgen
christoph.bollgen@jumo.net

The oldest recovered melting furnace to date is estimated to be 3 600 years old and was discovered in a palace on Crete. Of course JUMO has not been building industrial furnaces for quite as long, but we have managed to create an extensive portfolio of products and solutions in the over 70 years of company history.

Fact 1: Temperature probes

The high temperatures in industrial furnaces often require the use of thermocouples. Depending on the application site, different materials are used for the protective tubes in batch furnaces, continuous furnaces, test furnaces, or smelters. The material used for the pipes is gas-tight ceramics with which temperatures of up to 1 700 degrees Celsius can be achieved. JUMO thermocouples meet the requirements according to AMS2750 and CQI-9.

Fact 2: Control and automation technology

Precise temperature curves are absolutely essential for the often very complex processes involved in firing, annealing, or tempering a wide variety of materials. JUMO process controllers guarantee energy-optimized control of a wide variety of processes. PID control algorithms have an excellent track record in industrial furnaces, regardless of whether they are used in continuous-process or batch furnaces. The JUMO variTRON 500 also provides users with a complete automation system.

Fact 3: Recording and monitoring

Using the devices in the JUMO LOGOSCREEN family of paperless recorders, process data is collected quickly as well as smoothly and then archived in a tamper-proof manner. All recorders provide the following options: online visualization of process data, various limit value monitoring methods, a remote alarm in case of a malfunction, and the simultaneous recording of batch processes.

By using the compact and user configurable JUMO temperature limiter/monitor or safety temperature limiter/monitor, danger can be recognized early and averted. The devices meet the requirements of DIN EN 61508 (SIL) and DIN EN ISO 13849-1 (PL).

Fact 4: JUMO thermoCOR

The JUMO thermoCOR is a portable measuring system with which plant operators can independently perform SAT and TUS tests on a regular basis with the usual accuracy. The system is calibrated according to the DAkkS (German Accreditation Body) and meets the tolerance limits of the requirements according to the AMS2750 as well as CQI-9 standards.

Fact 5: Calibration laboratory

JUMO's DAkkS calibration laboratory has been performing calibrations for the measurand temperature since 1992. The laboratory has been constantly expanded over time and has been accredited for on-site calibration since 2014.

Contact: sensors@jumo.net

Good to know

You can find all important information about this topic in our industry portal: http://en.jumo.de/web/applications

Important information about the succe

7 at a glance

Trainer for Sensor and Automation Technology
Manfred Schleicher
manfred.schleicher@jumo.net

1 The measuring principle

Thermocouples consist of 2 metal legs with different thermoelectric properties. As the junction heats up, the free load carriers are accelerated and moved towards the colder end. Charge separation generates a voltage that increases with the temperature and conductivity of the material. The conductivity of both materials is different, which causes both legs to have different voltages. The difference between both voltages (U_{T1}) is a measure for the temperature at the junction or the measuring point.

On the connection side of the field device, 2 partial voltages are generated (U_{T2a} + U_{T2b}). The sum of the 2 voltages would also be generated if the thermocouple were to be shorted at this terminal temperature. The sum U_{T2} is thus a measure for the temperature at the connection point, also known as the cold junction. The voltage measured by the field device is a measure for the differential temperature – formed from the measuring point temperature – minus the cold junction temperature.

2 Compensating cables and plug connectors free from thermoelectric voltage

The second voltage (U_{T2}) must be generated at the cold junction. Thermocouples with the corresponding compensating cable are extended up to the field device. Furthermore, plug connectors free from thermoelectric voltage contribute to more accurate temperature measurement.

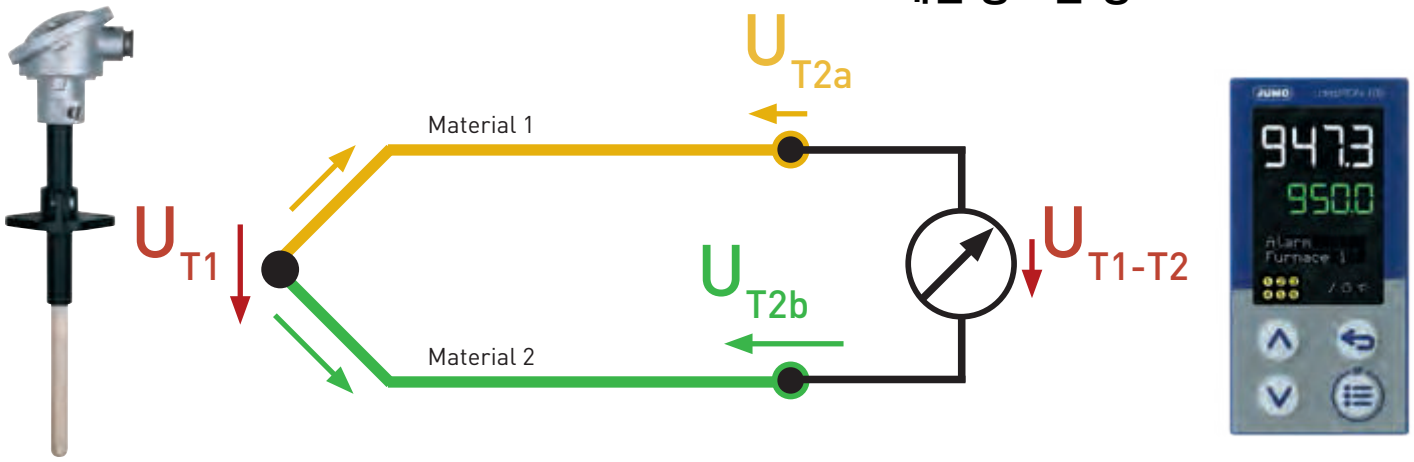
3 Internal temperature compensation

The field device determines the differential temperature from the voltage difference U_{T1} - U_{T2}. Cold junction temperature T2 is determined with an additional temperature probe. Cold junction temperature T2 is added to the differential temperature (T1 - T2 + T2). The result of internal temperature compensation is measuring point temperature T1.

4 Short-circuit consideration

The compensating cables consist of materials with the same thermoelectric properties as the thermocouple. A short circuit in the line therefore results in a second thermocouple connected in parallel. The determined temperature then corresponds to an approximation of the average value from the measuring point temperature and the temperature at the short circuit point. The recognition of the short circuit through the field device is not possible.

ssful use of thermocouples _써모커플의 성공적 적용에 대한 중요한 정보



Thermocouple | Measuring point/ transition point | Cold junction | Field device

5 Galvanic isolation in the measuring circuit

A short circuit can result between the thermocouple legs and the plant ground in applications with thermocouples. For example, this can happen between the connection of the junction and the protection tube (the goal being faster responsiveness) or due to reduced resistance of ceramic protection tubes when the measurement temperatures are high. In general, galvanic isolation should be used. This can be achieved with a transmitter, a supply isolator, or directly with the analysis unit.

6 Standardized thermocouples

Thermocouples are standardized to meet the DIN EN 60584-1 standard. They are therefore compatible in terms of electrical behavior. The most-applied non-metal elements are types J, K, and N. Elements S and B are expensive elements made from precious metals suitable for use at particularly high temperatures. The highest temperatures can be measured with element B. The standard recommends a maximum temperature of 1 700 degrees Celsius. After respective linearization (J, K, N ...) has been selected in the field devices, automatic conversion to the respective temperature takes place.

7 Information on long-term behavior

The maximum operating temperatures recommended in the standard for thermocouples apply to normal applications in clean air. In general, higher operating temperatures result in a stronger drift behavior. Furthermore, thermocouples change their output signal as foreign atoms enter (from the furnace atmosphere or from the protection tube). The elements must be calibrated regularly and the field device must be adjusted as needed. The intervals must be defined by the user. Ultimately the user needs to decide how long a thermocouple can be used in the respective application. ■

JUMO news

Get everything you need to know the topic in our technical literature "Electrical temperature measurement" and take our e-learning course specifically designed for thermocouples. You can find the overview at:
http://elearning.jumo-en.info

Digital training documents NEW for more convenience and sustainability

_더 편리하고 지속가능한 디지털 교육자료

Digitalization was already introduced at JUMO Campus a long time ago. E-learning courses have been a fixed component of the training opportunities for several years and, in addition, numerous live webinars have also been offered since 2016. After the webinars, the recordings are also available as videos for retrieval at any time – the digital course program currently comprises over 170 videos in German, English, and Spanish.

Now digitalization has also expanded to include training documents: in the past, each seminar participant received a folder with printed training documents. The drawback: the sometimes quite extensive documentation lead to high paper consumption – every folder contained an average of 130 pages. That weight also needed to be transported home by each participant.

New: digital documents via tablet

To reduce paper consumption and save resources, now each participant receives a tablet at the beginning of the training on which all documents are saved as a PDF file. Each tablet comes with a keyboard and a stylus pen that allow the participant to either write or type their notes. Once the seminar is over, each participant receives a USB flash drive to save the documents and all of their own notes.

Use of digital documents was tested with over 100 participants last year. The feedback was consistently positive: overall user-friendliness was rated with a grade of 1.4 (an "A" grade). Nearly 80 percent of participants preferred the digital documentation.

The advantages

This change will save over 50 000 pages of paper per year. But it is not just the environment that benefits from digitalization. The participants have more convenience: no heavy return transport and instead, easy transfer of the training documents from the USB flash drive to the PC. ■

JUMO news

We invite you to visit one of our numerous seminars and see for yourself how convenient it is. You can find all the training courses at: http://campus.jumo-en.info

Additional Chief Executive Officer at JUMO

JUMO Chief Executive Officers and General Partners Bernhard and Michael Juchheim have appointed Dimitrios Charisiadis as the third Chief Executive Officer. He will be responsible for the areas "Sales, Development, and Production". In the future, Bernhard Juchheim will be responsible for "Personnel" and Michael Juchheim for "IT and Finances". Dimitrios Charisiadis has been working with JUMO as the "Sales Director for Germany as well as Global Product and Market Segment Management" since 2017.

Dimitrios Charisiadis is responsible for 3 business areas as of 2020

"Since 2008, our turnover has increased to around EUR 70 million. Over 600 new jobs have been created," emphasizes Bernhard Juchheim. But this success is not a foregone conclusion. It is the result of the company making constant changes and improvements. *"It is our declared goal to position JUMO on the market in the long term in such a way that the corporate future for the fourth generation of the founding family is secured."*

New global challenges

However, according to Michael Juchheim, the challenges have dramatically increased in the last few years: *"The competitive pressure has grown enormously and issues like Brexit or global trade disputes create additional insecurity. Beyond that, digitalization offers us tremendous opportunities that we now need to seize."*

To meet the broad spectrum of tasks to be tackled, the Managing Partners decided to spread the leadership responsibility across more shoulders. *"This increases our room for maneuvering which gives us greater flexibility and the ability to react more quickly,"*, explains Michael Juchheim.

"With Dimitrios Charisiadis, we gained a Chief Executive Officer with comprehensive industry and product expertise as well as someone with years of career experience in a family-owned medium-sized company," adds Bernhard Juchheim.

Dimitrios Charisiadis sees excellent opportunities for the family business: *"The corporate group has enormous economic and technological potential. I look forward to accompanying JUMO on its way into the digital future."* ■

JUMO has experienced positive developments during the last several years!

Michael Juchheim, Bernhard Juchheim, Dimitrios Charisiadis

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