



More than **sensors + automation**



# Glass Industry

Innovative solutions for your success



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## Dear Reader,

Artificially produced glass is one of the oldest materials ever made by humans from natural resources. The story of its manufacturing can be traced back to 2,000 B.C. Prior to that time natural forms of glass, such as obsidian, were used in tools like wedges and blades.

Glass is still an extremely important product in many areas of our day-to-day life today. Its manufacturing falls into two categories: hollow glass and flat glass. We come across both forms on a daily basis in items such as glass bottles or window glass. However, only glass manufacturers know just how much glass production depends on reliable processes and precise measurement technology.

JUMO, your reliable partner with comprehensive expertise, is at your side to help when you have questions and need solutions.

No matter what your requirements for measurement technology, JUMO will always meet them with the ideal solution for specific applications in the glass industry.

So how do we do it? Through our years of experience and a high level of expertise. For more than 70 years JUMO

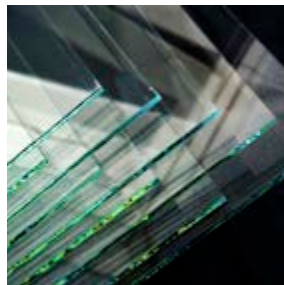
has been one of the leading manufacturers in the field of measurement and control technology and consequently the company is also a professional partner for the glass industry.

We place special importance on the constant development of new products, continuously improving existing ones, and on making production methods more and more economical. This is the only strategy through which we can achieve the highest level of innovation.

JUMO offers only the best products for the glass industry – a wide range of solutions that are perfectly tailored to the extreme temperatures in this area of production. This brochure gives you an overview of the products and systems we have developed especially for this field.

Of course, we would also be happy to work together with you to create customized solutions for individual requirements. The ultimate result of these solutions is consistently high quality!

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# Manufacturing of container glass

The container glass industry, which is also known as the hollow glass industry, manufactures all forms of glass packaging for the food, pharmaceutical, and chemical industries.

The first-class systems from JUMO help with these processes.





## Temperature solutions for container glass manufacturing

The glass industry deals with very high temperatures. The reason here is that the silicon dioxide needed to make the glass has to melt. This occurs at temperatures of about 1,600°C. The main challenge that the temperature sensors have is to take consistent measurements throughout the glass furnace's entire operating life. As a result, throughout the whole process temperatures have to be regulated with an extremely high level of precision over a long time.

A smelting furnace is made up of a melting vat, which holds the solid materials while they are heated. The dome of the vat is known as the crown. Measuring and controlling the temperature on the roof of the furnace is especially impor-

tant because precise adherence to the required temperature will prolong the crown's operating life and prevent overheating.

However, temperatures that are too low could have a negative impact on the melting rate and fuel consumption.

To ensure reliable measurement and controlling, suitable materials need to be selected for the temperature probes as they have to withstand high temperatures throughout the furnace's entire operating life. JUMO has extensive experience in the area of temperature sensor manufacturing for the glass industry and uses components such as ceramic immersion sleeves.

### Push-in thermocouple

For the feeder  
Type 901830



### Screw-in thermocouple

For the flue  
Type 901830



### Push-in thermocouple

For the feeder  
Type 901830



### JUMO IMAGO 500

Multichannel process and program controller  
Type 703590



### JUMO dTRON 304/308/316

Compact controller with program function  
Types 703041, 703042, 703043, 703044



### JUMO DICON touch

Two-channel/four-channel process and program controller  
Type 703571



### JUMO variTRON 300

Central processing unit for automation system with optional wireless interface  
Type 705003

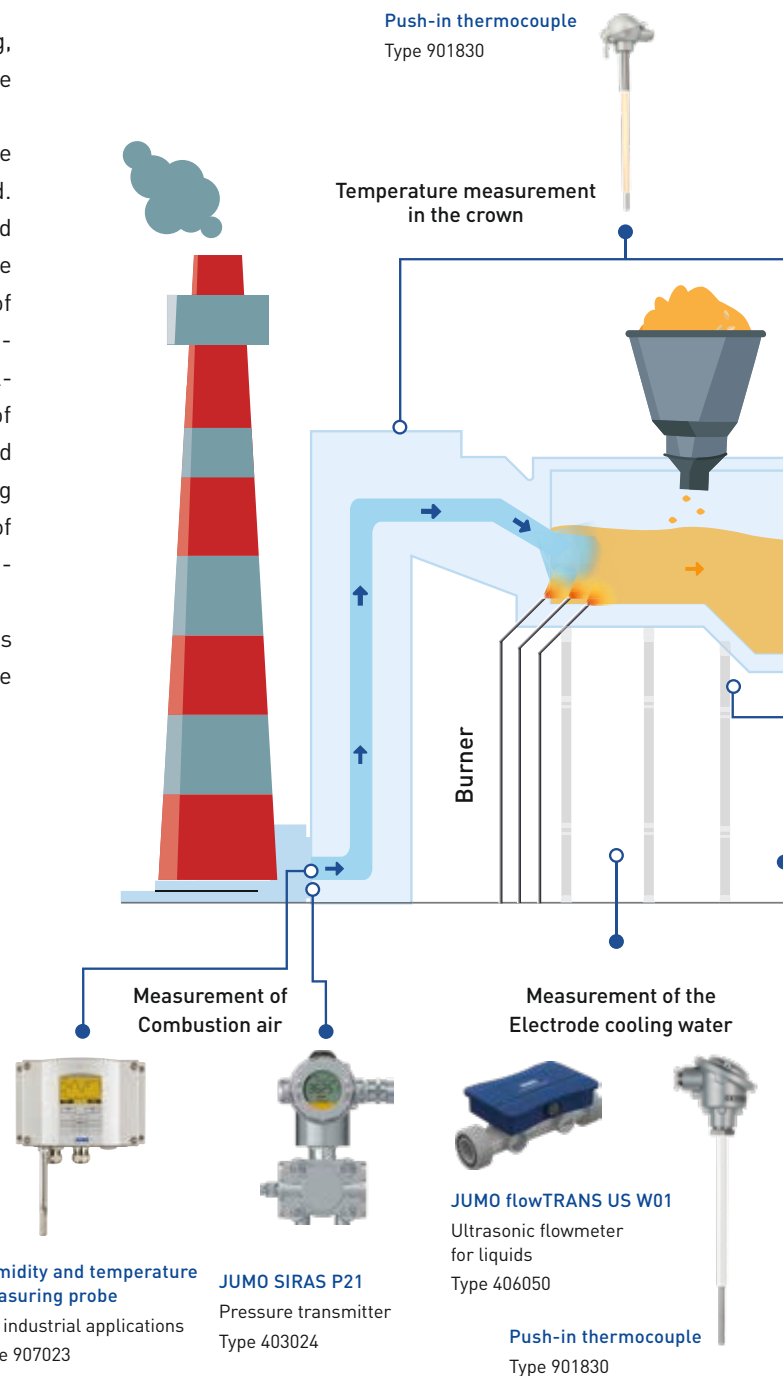


## An overview of container glass manufacturing

Hollow glass is manufactured using compression, blowing, and suction procedures as well as a combination of all three techniques.

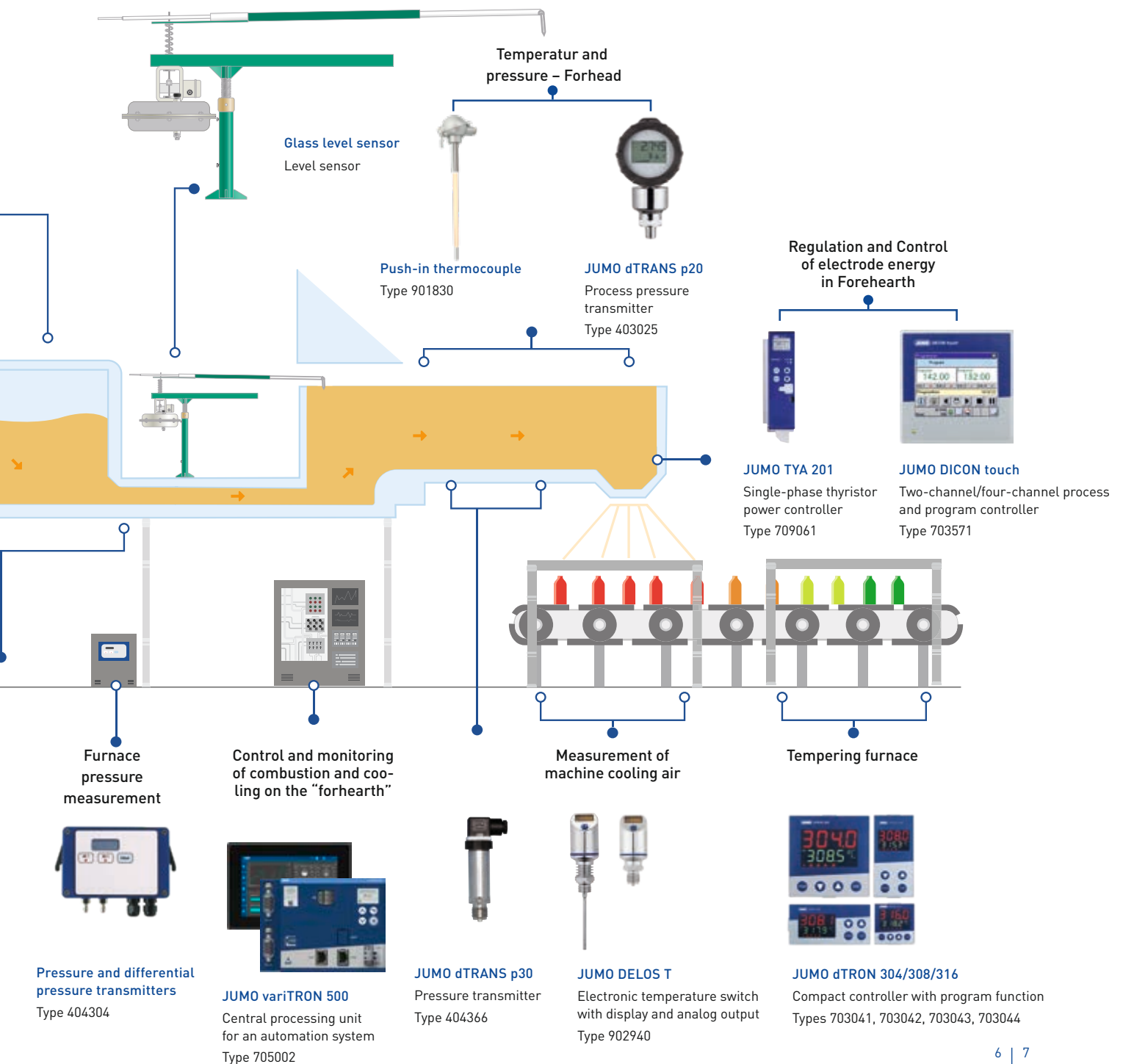
As a result, the majority of the machines in this field use a blow-and-blow method or a press-and-blow method. Carousel machines using the press-and-blow method are used to produce delicate table wear. Because the material expands in different ways, each piece of glass is subject to a certain level of mechanical tension during manufacturing. A material's susceptibility to tension depends on the expansion coefficient of the type of glass in question and has to be reduced using temperature equalization. For each glass a cooling range that lies between the upper cooling temperature of 590 °C (viscosity of 1013 dPas) and the lower cooling temperature of 450 °C (1014.5 dPas) can be defined. These tensions are reduced by "tempering". This process refers to the defined, slow cooling of the glass within the cooling range.

## OVEN





## FOREHEARTH







# Manufacturing of flat glass

The flat glass industry produces glass for fields such as construction, vehicle manufacturing, and furniture.

The first-class systems from JUMO support you with the manufacturing of these glasses.



## Control solutions for the flat glass industry

In addition to measuring temperature, temperature control also plays a major role in the glass industry. Other than premium temperature probes developed especially for this field JUMO has also created various custom-made controllers and automated solutions for the industry. The one-channel controllers in the JUMO dTRON range, the multichannel controllers, JUMO DICON touch, and JUMO IMAGO 500 series can be used in various glass manufacturing processes and control a wide range of process variables.

### JUMO IMAGO 500

Multichannel process and program controller  
Type 703590



### JUMO dTRON 304/308/316

Compact controller with program function  
Types 703041, 703042, 703043, 703044



### JUMO DICON touch

Two-channel/four-channel process and program controller  
Type 703571



### Push-in thermocouple

For the vat  
Type 901110



### Push-in thermocouple

For the furnace  
Type 901830



### JUMO Etemp B

Screw-in RTD temperature probe with form B terminal head for standard applications  
Type 902023



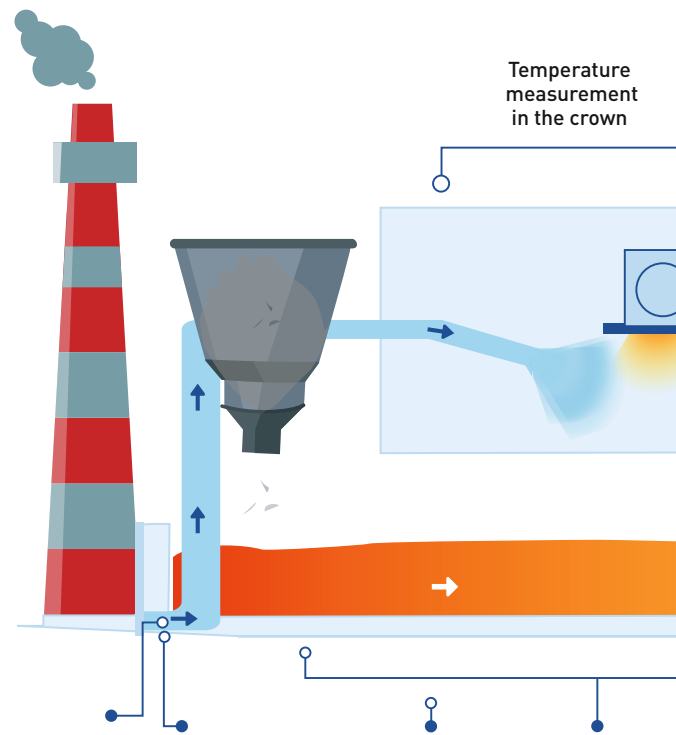


## An overview of flat glass manufacturing

Machine-drawn, rolled-plate, or cast flat glass is normally produced using a float glass method in which the melted glass floats on a layer of tin which has also been melted. This ensures a high level of product quality.

The rolling and drawing methods are usually used to manufacture flat glass with unique properties or a certain surface structure. The float glass process was developed by the glass manufacturer and processor Pilkington in 1959. It saw the start of a mini industrial revolution as today practically all glass used in the construction industry is manufactured with this method. The name "float glass" refers to the glass being melted on a reservoir in a furnace during the manufacturing process. Afterwards, the produced mass is then routed into a chamber which holds a bath made out of molten tin. The molten glass floats on the tin, spreads out, and moves horizontally towards the chamber's outlet. It then passes through a cooling tunnel before being cut. This method can be used to manufacture high-quality glass.

## OVEN



**Humidity and temperature measuring probe**  
For industrial applications  
Type 907023



**JUMO SIRAS P21**  
Pressure transmitter  
Type 403024



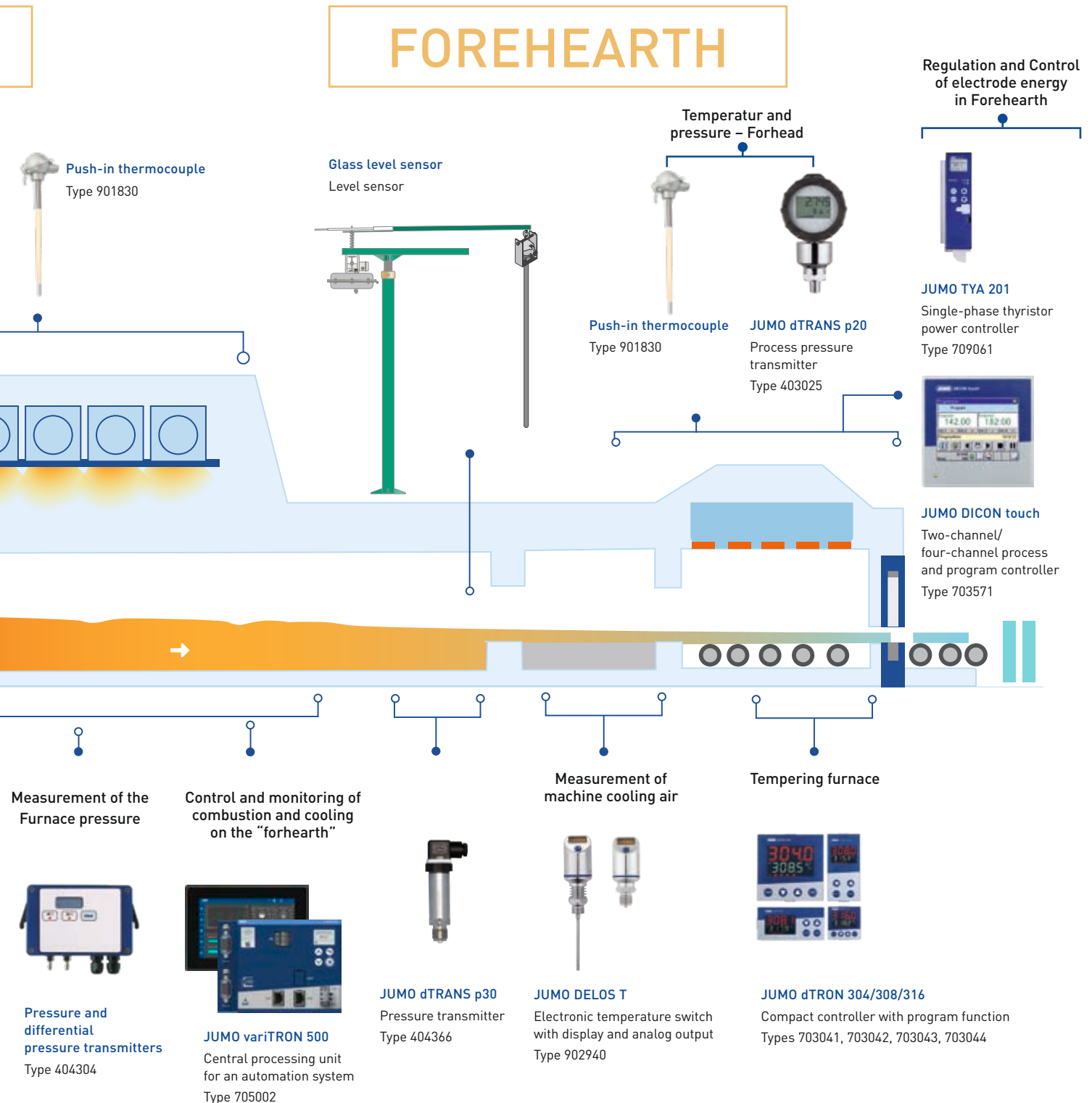
**JUMO flowTRANS US W01**  
Ultrasonic flowmeter  
for liquids  
Type 406050

**Push-in thermocouple**  
Type 901830





## FOREHEARTH



Regulation and Control of electrode energy in Forehearth



**JUMO TYA 201**  
Single-phase thyristor power controller  
Type 709061



**JUMO DICON touch**  
Two-channel/ four-channel process and program controller  
Type 703571

Temperatur and pressure - Forhead

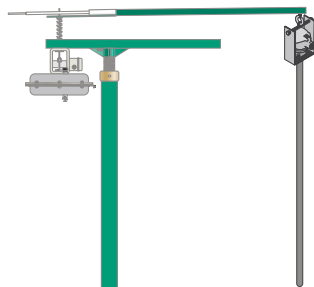


Push-in thermocouple  
Type 901830



**JUMO dTRANS p20**  
Process pressure transmitter  
Type 403025

Glass level sensor  
Level sensor



Push-in thermocouple  
Type 901830



Measurement of machine cooling air



**JUMO DELOS T**  
Electronic temperature switch with display and analog output  
Type 902940

Tempering furnace



**JUMO dTRON 304/308/316**  
Compact controller with program function  
Types 703041, 703042, 703043, 703044

Control and monitoring of combustion and cooling on the "forehearth"



**JUMO variTRON 500**  
Central processing unit for an automation system  
Type 705002

Measurement of the Furnace pressure



**Pressure and differential pressure transmitters**  
Type 404304

**JUMO dTRANS p30**  
Pressure transmitter  
Type 404366

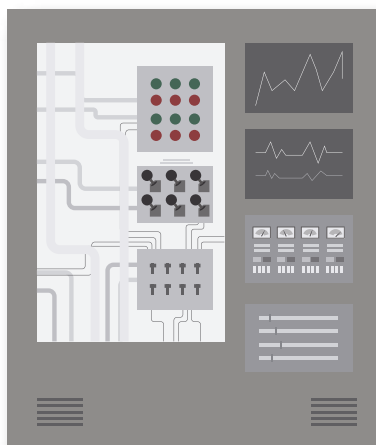




## Equipment in the control cabinet

JUMO is not only the perfect solution provider for the glass industry, but also offers the design and construction of control cabinets in addition to the fully comprehensive project planning of automation solutions. Furthermore, both the JUMO variTRON automation system

as well as our compact and multichannel controllers can be used as backup systems for higher-level controllers. Communication takes place via modern industrial interfaces.



**Pressure and differential pressure transmitters**  
Type 404304

**Measurement of the Furnace pressure**

**NEW**

**JUMO variTRON 500**  
Central processing unit for an automation system  
Type 705002

**Control and monitoring of combustion and Cooling in the "forehearth"**

**JUMO dTRANS T06**  
Multifunctional four-wire transmitter in mounting rail case  
Type 707071

**JUMO dTRANS T08 and S08**  
Temperature transmitter series 6 mm and signal and isolating converter  
Type 707101, 707203

**JUMO dTRANS T05**  
Programmable transmitter in two-wire technology  
Type 707050

**JUMO safetyM STB/STW**  
Safety temperature limiter, safety temperature monitor  
Type 701150

**JUMO IMAGO 500**  
Multichannel process and program controller  
Type 703590

**JUMO diraTRON 104/108/116/132**  
Compact controller  
Types 702110

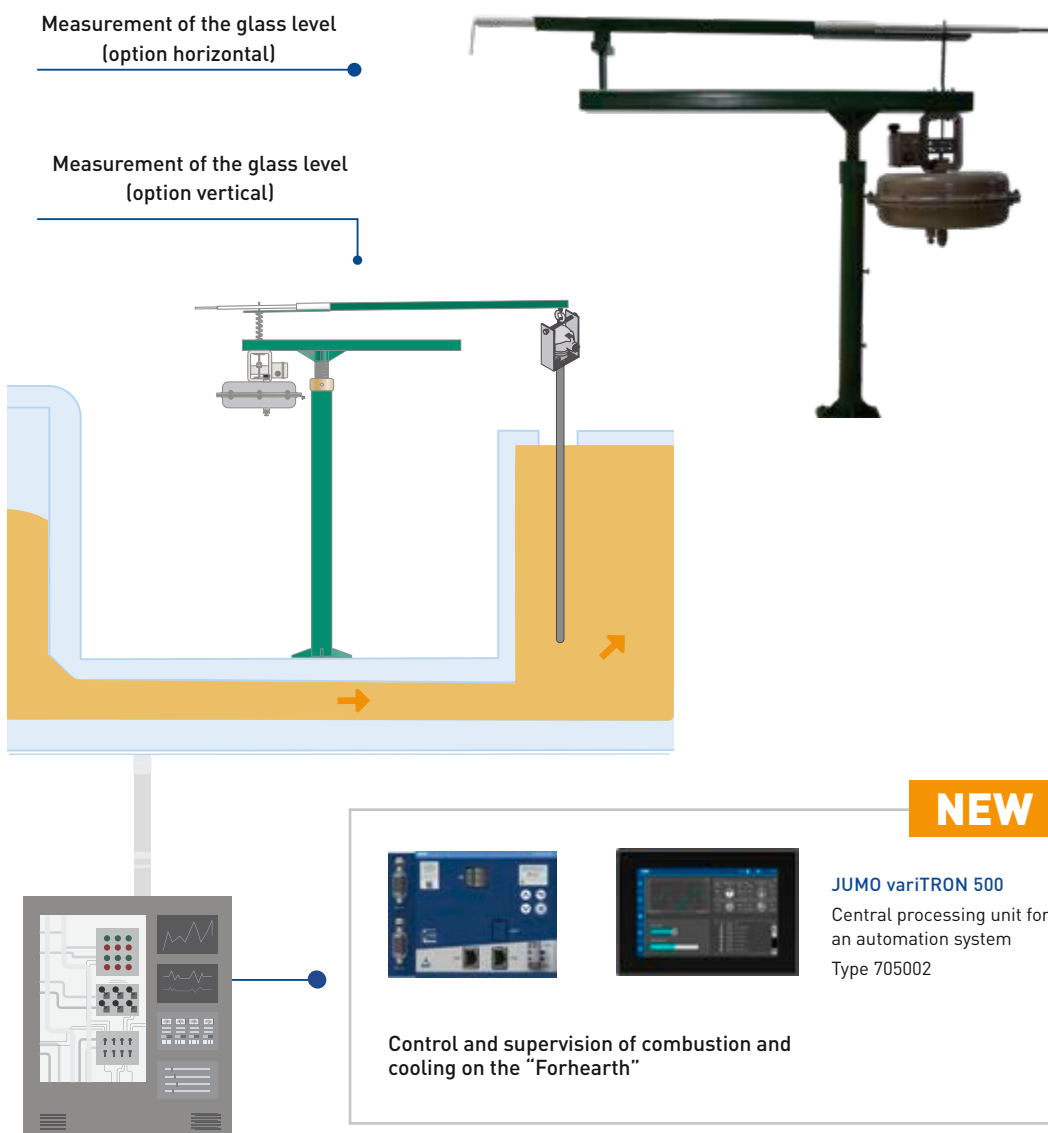


## Level measurement in liquid glass

The measurement of the glass level is highly critical due to the high temperatures. A level sensor that has been especially designed for the glass industry can determine the filling height of the liquid glass.

The sensor taps on the glass surface which allows it to determine the immersion depth up to that point. That is how

the height of the glass melt – the glass level – is calculated. The measurement and calculation as well as the configuration of the level sensor are done through the Automation system JUMO variTRON 500.







# JUMO variTRON 300 and 500

## Automation system

The automation system from JUMO has a modular design and is highly scalable. JUMO variTRON is based on the JUMO JUPITER hardware and software platform. CODESYS PLC transforms the system into a PLC, which can implement a wide range of control applications.



### Features:

- High speed performance
- Flexible operating philosophy
- Simultaneous operation of more than 120 control loops
- Modern communication interfaces (e.g. OPC UA and MQTT)
- Integration of various fieldbus systems such as PROFINET, EtherCAT, Modbus TCP/RTU, and BACnet
- Many degrees of freedom in software and hardware
- Easy integration of new software functions via CODESYS PLC
- Easy adaptation of hardware inputs and outputs
- Customer-specific operation and visualization of several operator stations via CODESYS Remote TargetVisu and CODESYS WebVisu
- More than 30 intelligent connection modules
- Panels in various formats (portrait or landscape, 4:3 or 16:9)
- JUMO Web Cockpit
- Integrated measurement recording with up to 240 channels, up to 20 batches, and up to 10 measurement groups
- Optional wireless interface (JUMO variTRON 300)



## JUMO Cloud and JUMO smartWARE SCADA

### Highly-scalable and high-performing IoT solutions

Enhance JUMO variTRON with the right IoT solution: use the JUMO Cloud for worldwide access to your measurement data and benefit from data management by JUMO – including backups. Or operate JUMO smartWARE SCADA on your own servers. The software also offers many different interfaces and protocols.

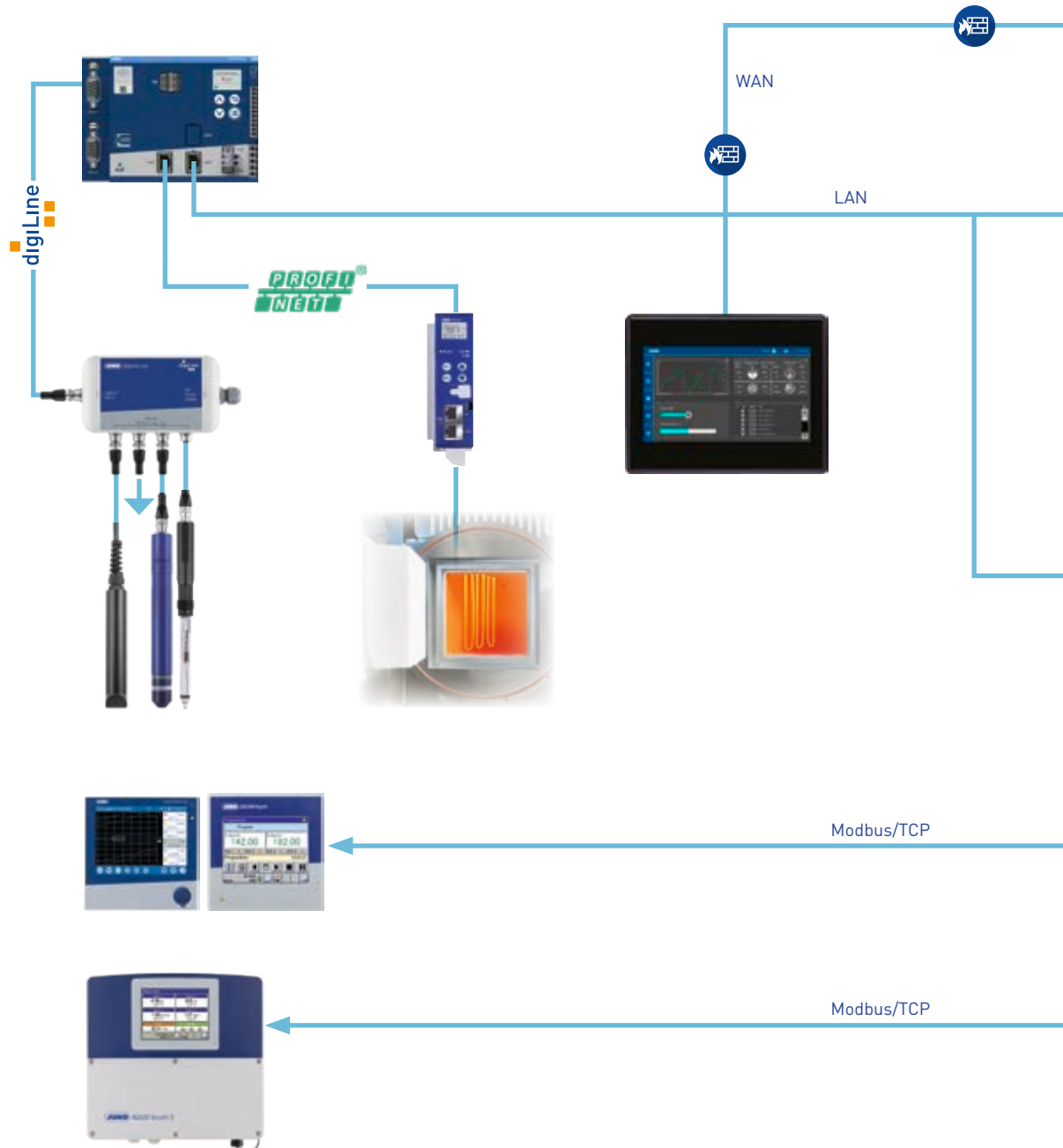


#### Features:

- Compatible with JUMO variTRON and connectable via Ethernet (JUMO variTRON as gateway)
- Maximum transparency in your processes with customizable user rights and dashboards
- Unlimited access to the dashboards using as many end devices (clients) as required – common web browsers are used so that installing software, browser plug-ins, or add-ons is not necessary
- More efficient reporting made possible due to outstanding report and export functions
- Alarm management through data evaluation, preparedness planning, and monitoring/remote alarm functions (text message, email, push message, phone call)
- Process visualization through editor with integrated animation and test tool as well as vector-based, self-scaling process screens
- End-to-end encryption, HTTPS, TLS, two-factor authentication (OTP)
- Extensive trend displays and reports with various diagrams, comparison functions, and export functions
- Timer and timer programs with unique events and series
- Modern drivers and protocols such as OPC UA, MQTT, and REST API



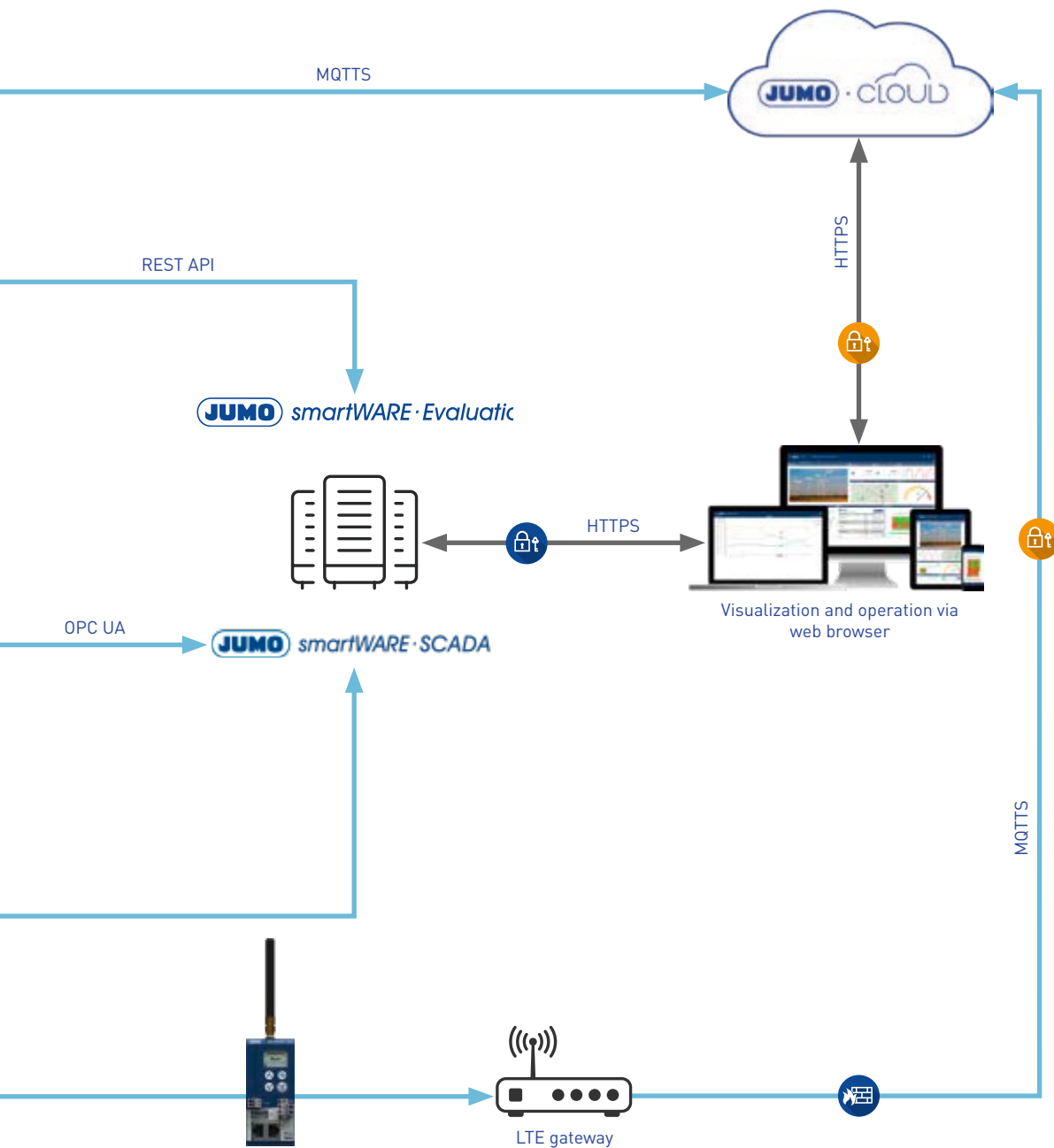
## System structure – JUMO variTRON available with JUMO smart







## smartWARE Evaluation, JUMO Cloud, or JUMO smartWARE SCADA





# Services & Support

It is the quality of our products that is responsible for such a high level of customer satisfaction. But our reliable after-sales service and comprehensive support are also valued. Let us introduce you to the key services we provide for our innovative JUMO products. You can count on them – anytime, anywhere.

**JUMO Services & Support – so that it all comes together!**

## Manufacturing Service



Are you looking for a competitive and efficient system or component supplier? Regardless of whether you seek electronic modules or perfectly fitting sensors – either for small batches or mass production – we are happy to be your partner. From development to production we can provide all the stages from a single source. In close cooperation with your business our experienced experts search for the optimum solution for your application and incorporate all engineering tasks. Then JUMO manufactures the product for you.

As a result you profit from state-of-the-art manufacturing technologies and our uncompromising quality management systems.

### Customer-specific sensor technology

- Development of temperature probes, pressure transmitters, conductivity sensors, or pH and redox electrodes according to your requirements
- A large number of testing facilities
- Incorporation of the qualifications into application
- Material management
- Mechanical testing
- Thermal test



### Electronic modules

- Development
- Design
- Test concept
- Material management
- Production
- Logistics and distribution
- After-sales service



### Metal technology

- Toolmaking
- Punching and forming technology
- Flexible sheet metal machining
- Production of floats
- Welding, jointing, and assembly technology
- Surface treatment technology
- Quality management for materials





## Information & Training



Would you like to increase the process quality in your company or optimize a plant? Then use the offers available on the JUMO website and benefit from the know-how of a globally respected manufacturer. For example, under the menu item "Services and Support" you will find a broad range of seminars. Videos are available under the keyword "E-Learning" about topics specific to measurement and control technology. Under "Literature" you can learn valuable tips for beginners and professionals. And, of course, you can also download the current version of any JUMO software or technical documentation for both newer and older products.

## Product Service



We have an efficient distribution network on all continents available to all of our customers so that we can offer professional support for everything concerning our product portfolio. Our team of professional JUMO employees is near you ready to help with consultations, product selection, engineering, or optimum use of our products. Even after our devices are commissioned you can count on us. Our telephone support line is available to give you answers quickly. If a malfunction needs to be repaired on site our Express Repair Service and our 24-hour replacement part service are available to you. That provides peace of mind.

## Maintenance & Calibration



Our maintenance service helps you to maintain optimum availability of your devices and plants. This prevents malfunctions and downtime. Together with the responsible parties at your company we develop a future-oriented maintenance concept and are happy to create all required reports, documentation, and protocols. Because we know how important precise measurement and control results are for your processes we naturally also professionally calibrate your JUMO devices – on site at your company or in our accredited DAkkS calibration laboratory for temperature. We record the results for you in a calibration certificate according to EN 10 204.

