



More than **sensors + automation**

CO<sub>2</sub>



# Humidity

Innovative solutions for the toughest requirements



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## Dear Reader,

JUMO provides a comprehensive range of measurement technology for the control of air humidity and quality in the fields of air conditioning and ventilation. Depending on the application, various measuring probes are available with capacitive and hygrometric sensor technology or hygrostats as pure switching devices. CO<sub>2</sub> measuring probes with proven infrared technology are used for measuring the concentration of carbon dioxide.

Sturdy, top-quality microprocessor-controlled measuring probes are available for challenging industrial measurement tasks. They also allow for the output of other measurands such as absolute humidity, dew point temperature, mixing ratio, etc. The outstanding features include stable and reliable measurements, high measuring accuracy, traceable measuring results, and a wide range of configuration options directly on the measuring probe.

Further devices with intelligent interchangeable probes or intrinsically safe measuring probes for applications in Ex-areas complete the product range.

Upon request, a reliable after-sales service is also available for repair, maintenance, and calibration purposes. You have a skilled partner at your side with JUMO.

Detailed information about our products can be found under the specified type/product group number at [www.jumo.net](http://www.jumo.net).



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# Humidity measurement

Along with temperature, humidity is a very important process variable. For example, the relative humidity of an environment has a major effect on our sense of well being and state of health. In industrial processes, the right humidity level is often a determining factor for the competitiveness and quality of products. A correctly adjusted humidity level can also contribute to considerable savings in energy consumption. The list of applications in which air humidity measurements are important could go on forever. Continuous monitoring of the air humidity is highly relevant wherever chemical, physical, or biological processes are caused or affected by the content of water vapor in the air.





## Application: climate monitoring

Hygro transducer/hygrothermal transducer and CO<sub>2</sub> measuring probe for climate monitoring

Rod version

Types 907021/60



With over 8.3 million visitors, the “Musée du Louvre” is the most visited museum in the world.

### “JUMO ensures the right climate!”

The temperature and humidity in the “Salle des Etats” room in the Louvre in Paris – where Leonardo da Vinci’s famous painting of the “Mona Lisa” hangs – is monitored by JUMO sensors. A total of twelve hygrothermal transducers (rod version) are installed in the exhibit room. In every corner of the room at heights of two and four meters, type 907021/60-2-14-051 measuring probes are mounted. Four additional hygrothermal transducers are also mounted in the display case.

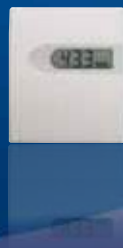
The rod version was selected because of its very small design, its extremely quick response time, and high level of accuracy. These combined measuring probes for humidity and temperature also feature outstanding long-term stability.

The standardized analog output signals for the measurands relative humidity and temperature, with 0 to 1 V each, were connected to a controller, which performs the air conditioning tasks for the entire room.



# Capacitive measuring probes

Capacitive measuring probes work according to the principle of absorption. This means the sensor constructed in the multilayer system functions essentially like a moisture-dependent condenser. Water molecules bond to a special hygroscopic polymer layer. Depending on the retained moisture, the result is a change of the dielectric constant and therefore a change in capacity. Then a downstream electronics unit generates a corresponding standardized electrical output signal.



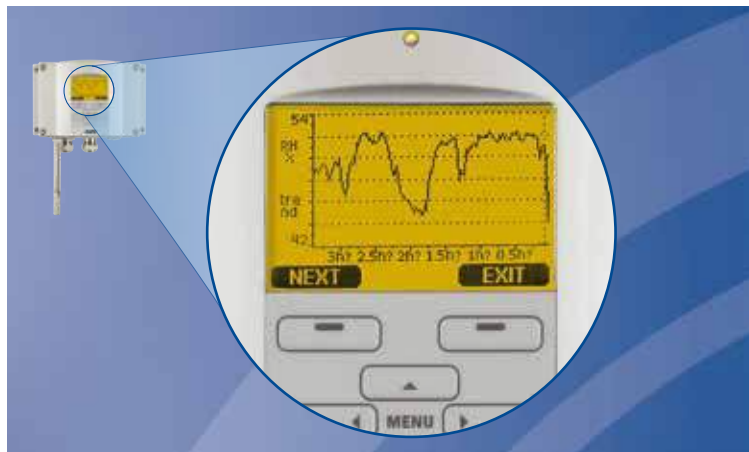
The introduction of capacitive sensors for humidity measurements has opened up entirely new possibilities for both industrial and air conditioning applications. Some of the outstanding features of these devices include small sizes and fast response times. They are also largely impervious to

pollutants, dust, and condensation. But above all, the complete measurable range of humidity and wide temperature range as well as the mechanical and electronic additions allow for such a wide range of applications.

## Measuring probes for air conditioning measuring technology and building automation



	Description	Hygro transducers and hygrothermal transducers	
	Type/data sheet	907020	907021
Application	Version	Indoor, duct, wall-mounted and rod version	
	Application	Ventilation and air-conditioning	Building automation, storerooms, air conditioning/ventilation control systems
Technical data	Sensing element	Capacitive (resistant to condensation, fast response)	
	Measurement medium	Air, atmospheric pressure (non-aggressive)	Air, non-pressurized. The coating of the sensor permits measurements in numerous aggressive media (exception: indoor version)
	Measuring range	RH = 0 to 100 % RH T = -40 to +80 °C (depending on type)	
	Output	4 to 20 mA, 0 to 1 V, 0 to 10 V, and Pt100 (with T passive)	4 to 20 mA, 0 to 1 V, 0 to 5 V, 0 to 10 V, and Pt100/Pt1000 (with T passive)
	Voltage supply	DC 24 V (standard), others depending on the version	
	Protection type	IP30 indoor version, IP64 duct version, IP65 wall-mounted and rod version	IP20 indoor version, IP65 wall-mounted, duct, and rod version
	Approval	–	Metrological registration
	Special feature	HOLDERS and replaceable filters available as accessories	Replaceable filters available as accessories



## Measuring probes for challenging industrial and cleanroom applications

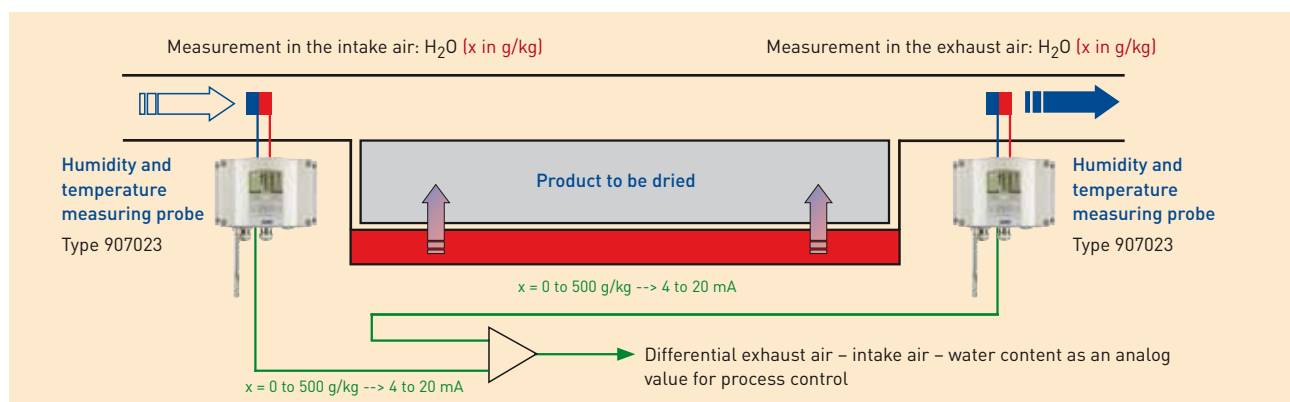


Application	Description	Humidity and temperature measuring probe in a sturdy industrial version	Intrinsically safe industrial measuring probes for humidity, temperature, and derived measurands	Capacitive hygrothermal transducers with intelligent interchangeable probes
	Type/data sheet	907023	907025	907027
	Version	Industrial version in wall design type with process-specific probes	Industrial version in wall design type (ATEX) with intelligent interchangeable probes	Air conditioning and lab version in wall design type with intelligent interchangeable probes
Technical data	Application	Measurements in challenging industrial applications as well as under harsh operating conditions	Pharmaceutical industry, petrochemical industry, food technology	Air conditioning measuring technology, pharmaceutical industry, greenhouses, cleanrooms, store-rooms, and cold stores
	Sensing element	Capacitive (resistant to condensation, fast response)		
	Measurement medium	Air, compressed air, vacuum		Air, atmospheric pressure
	Measuring range	RH = 0 to 100 % RH, T = -70 to +180 °C (depending on type), optionally with: d+Td+a+x+Tw+ppm+pw+pws+h+dT	RH = 0 to 100 % RH, T = -40 to +180 °C (depending on type), optionally with: Td+a+x+Tw	RH = 0 to 100 % RH, T = -40 to +80 °C
	Output	4 to 20 mA, 0 to 20 mA, (optionally 3 channels), 0 to 1 V, 0 to 5 V, 0 to 10 V	4 to 20 mA, (optionally 2 channels)	4 to 20 mA, 0 to 1 V, 0 to 5 V, 0 to 10 V
	Voltage supply	DC 10 to 35 V, AC 24 V, (optionally AC 100 to 240 V, also with connecting cable)	DC 24 V (via Ex "i" supply isolator or Zener barrier)	DC 24 V (standard), others depending on the version
	Protection type	IP65 wall-mounted version (metal case)		IP65 wall-mounted version (metal case), IP10/IP40, with cable entry in the rear
	Approval	Metrological registration	Ex II 1 G Eex ia IIC T4 Ga (ATEX) Ex II 1 D IP65 T=70 °C Da (with protective cover)	–
	Special feature	Housing with graphical LCD display and operator panel; 7 probes with various process connections and sensor cable 2 m, 5 m, or 10 m long; serial interfaces, relays	Housing with LCD display and operator panel; 5 probes with various process connections and cable length 2 m, 5 m, or 10 m	Housing optionally with LCD display; adapter cables 2 m, 5 m, or 10 m long, duct installation kits as well as various replaceable filters are in stock and available immediately as accessories





## Application: industrial drying process



### Application – humidity measurement technology

#### Humidity measurement in the drying process

If a product needs to be dried, one must generally have continuous information about the water content (material humidity) of the product that is drying to optimally control the drying process. In actual applications, however, problems large and small often stand in the way of implementing such a measurement task.

#### Example: industrial drying process

A humidity transducer with integrated computing function for absolute humidity in g/kg (x = mixing ratio) is mounted in the intake air and in the exhaust air duct of a drying chamber. The difference between the two measured values is an indication of the amount of discharged water, which enables optimum control of the drying process.

#### Operation

The amount of water in the air is determined in the intake air duct through which the drying chamber is supplied with fresh air from outside. The same process is repeated in the exhaust air chamber.

If the product to be dried is now heated in the chamber, it can no longer absorb moisture from outside. Instead, the

product emits the releasable moisture through evaporation to its surroundings..

The moisture in the exhaust air therefore increases by the corresponding amount and will then be higher than the moisture content in the intake air. Since absolute humidity is expressed in g/kg, differences in temperature between the intake and exhaust air do not play a role. A controller with a differential input for standardized output signals in a downstream electronics unit can then take over active control tasks.

#### Benefits

- This solution only activates the heating process for as long as a difference in humidity between the intake and exhaust air exists. This saves heating costs as they can be reduced to a necessary minimum!
- Simple use of the most varied products to be dried thanks to a solution with two measuring probes (measurement in the intake and exhaust ducts)
- Time-consuming experiments to determine the process parameters – as required for single-point measurement – are no longer necessary.



# CO<sub>2</sub> measuring probes

These devices from JUMO work according to the infrared principle (NDIR). The gas exchange with the CO<sub>2</sub> sensor takes place via a membrane through diffusion. That means the air circulates in a closed system and that no pollutants contaminate the optical measuring track. In addition, the patented autocalibration process compensates the effects of aging, even without fresh air being introduced, thereby ensuring outstanding long-term stability.



Our state-of-the-art CO<sub>2</sub> measuring probes enable precisely controlled exchange of air in rooms, halls, and similar structures. The probes ensure a healthy indoor climate and the optimal well-being of the occupants while at the same time ensuring significant energy savings potential as required by

EU standards and regulations such as the "Energieeinsparverordnung" (EnEV) (Energy Saving Ordinance). Measuring ranges can extend from 0 to 2000/5000/10000 ppm. Standardized analog outputs with 0 to 10 V or 4 to 20 mA are available as the measurement signal.

## CO<sub>2</sub> measuring probes for determining air quality (concentration of carbon dioxide)



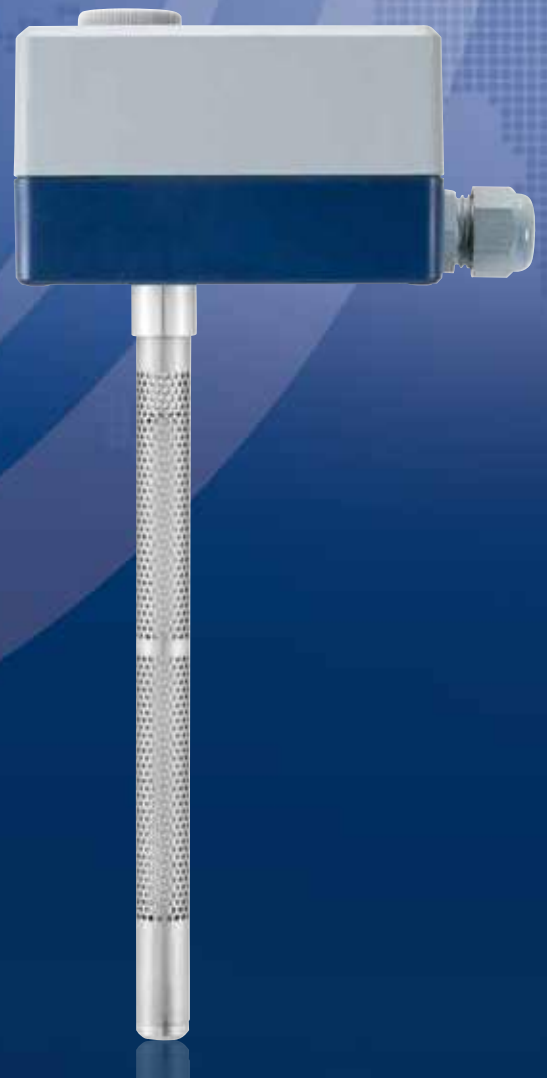
	Description	CO <sub>2</sub> measuring probes
	Type/data sheet	907021
Application	Version	Indoor, wall-mounted/duct version
	Application	Building automation, storerooms, and air conditioning/ventilation control systems
Technical data	Sensing element	NDIR method (non-dispersive infrared technology)
	Measurement medium	Air
	Measuring range	CO <sub>2</sub> = 0 to 2000/5000/10000 ppm, T = 0 to 50 °C (scaling active with analog output), RH = 0 to 100 % RH
	Output	4 to 20 mA, 0 to 10 V, and Pt100/Pt1000 (with T passive)
	Voltage supply	DC 24 V (standard), others depending on the version
	Protection type	IP20 indoor version, IP 65 duct version
	Ambient temperature	-20 to +60 °C indoor and duct version, -5 to +55 °C, indoor version with LCD display



# Hygrometric measuring probes and hygrostats

The special properties of hygroscopic fibers are used in hygrometric measuring probes and hygrostats to determine the relative air humidity.

Due to a special preparation, the hair measuring element is capable of absorbing moisture. The change in length of this element is the externally measurable effect that is used to determine the prevailing air humidity.





Hygrometric humidity transducers are suitable for both air conditioning applications and humidity measurements in industrial applications. The main advantage they offer is the highly water resistant sensing element. Another advantage is zero voltage operation for device versions with a passive output or for hygrometers with a switching output.

## Measuring probes for air conditioning measuring technology and ventilation systems



	Description	Hygro transducers and hygrometers	Hygrometers
	Type/data sheet	907031	907032
Application	Version	Indoor and duct version	
	Application	Air-conditioning and ventilation technology, greenhouses, ripening chambers, fruit and vegetables (storage)	Humidifying and dehumidifying, storage, cold stores, greenhouses, control cabinets
Technical data	Sensing element	Hygrometric (water-resistant element)	
	Measurement medium	Air, atmospheric pressure (non-aggressive)	
	Measuring/working range	RH = 0/30 to 100 % RH, T = -40 to +80 °C	RH = 30 to 100 % RH
	Output	4 to 20 mA, 0 to 20 mA, 0 to 10 V, as well as various resistance outputs	Switching output, floating changeover contact max. AC 250 V/15 A, depending on the version, also with double contact.
	Voltage supply	DC 24 V (standard), not required for passive version	–
	Protection type	IP20 indoor version, IP 64 duct version	
	Approval	GOST	–
	Special feature	Holders, sun and rain protection, as well as filter tubes available as accessories	

# Wireless measured value transmission

In buildings, the measurement of parameters such as air humidity and temperature often requires that cables are laid, which is cost and time intensive. This installation work can be reduced to a minimum by using wireless data transmission. Here, the JUMO Wtrans series offers an effective and cost-efficient alternative to conventional cabled measuring probes.

The measured value is initially transmitted to the JUMO Wtrans receiver. From there, the signal can be forwarded in either digital or analog form for further processing to various measurement and control technology devices such as controllers, automation systems, indicators, or recorders.



## JUMO Wtrans E01 measuring probe for humidity, temperature, and CO<sub>2</sub> with wireless data transmission

The JUMO Wtrans E01 measuring probe is used in combination with the JUMO Wtrans receiver for recording the measured values of humidity, temperature, and CO<sub>2</sub>.

The device has two M12 x 1 plug connectors with a practical Plug and Play function. Just a few seconds after the sensors have been connected, the measured values appear in an alternating sequence on the LCD display. Configuration and parameterization can be conveniently carried out with

the JUMO setup program via the integrated USB interface. Depending on the use, the voltage can be supplied either by customary AA batteries or by a 24 V power supply unit.

The integrated microcontroller enables the display of the measurands absolute humidity (g/m<sup>3</sup>), dew point temperature (°C, °F), mixing ratio (g/kg), steam pressure (mbar/hPa), wet-bulb temperature (°C, °F), and specific enthalpy (MJ/kg), which are calculated from the measured values.

Sensor for humidity and temperature (combined)	Measuring range	Measurement uncertainty
Humidity measurand (RH = relative humidity)	0 to 100 % RH (RH = relative humidity)	±2 % (0 to 90 % RH) ±3 % (90 to 100 % RH)
Temperature measurand	-40 to +80 °C	±0.2 K at 20 °C
Response times (in air 2 m/s) - Humidity - Temperature	t0.9: approx. 30 s t0.63: approx. 240 s	
Sensor for CO <sub>2</sub>	Measuring range	Measurement uncertainty
CO <sub>2</sub> measurand (available measuring ranges)	0 to 2000 ppm 0 to 5000 ppm 0 to 10000 ppm	±(50 ppm + 2 % of the measuring range) ±(50 ppm + 3 % of the measuring range) ±(100 ppm + 5 % of the measuring range)
Response time (in air 2 m/s)	t0.9: approx. 195 s	
Sensor for temperature	Measuring range	Measurement uncertainty
RTD temperature probe Pt1000, class A acc. to DIN EN 60751	-50 to +150 °C	±(0.15 K + 0.002 ×  t )  t  = measured temperature in °C without prefix sign
Connection type	Four-wire electrical circuit	
Sensor current	≤ 500 µA	
Line resistance	Maximum 11 ohm per wire	
Response times (with 4 mm protection tube)	In water (0.4 m/s): t0.5: approx. 3 s; t0.9: approx. 7 s In air (3 m/s): t0.5: approx. 25 s; t0.9: approx. 80 s	
Wireless measuring probe	Technical data	
Voltage supply	4 AA batteries or 24 V power supply unit	
Protection type	IP65	
Radio frequency	868.4 MHz	



## JUMO Wtrans T receiver for data transmission

The Wtrans receiver can control up to 16 channels. Each measured value from the JUMO Wtrans E01 transmitter is assigned to one of the 16 channels. As a result, if only one measured value is transmitted per transmitter, up to 16 transmitters may be connected to one receiver.

Offset, alarms, limit values, and other parameters can be configured individually for each separate transmission channel. The receiver can be configured and operated using the keypad on the front or via a PC setup program which can be operated intuitively.

The measured values are displayed in an alternating sequence on the LCD display and can be tapped at the outputs in digital or analog form for further processing.

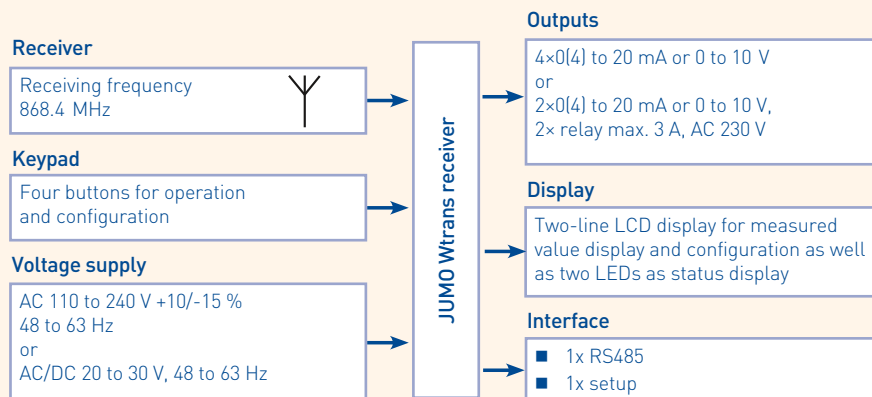


### Features

#### JUMO Wtrans receiver with DIN-rail housing

- Compatible with all JUMO Wtrans series devices
- Up to 16 transmitters per receiver (can be freely combined)
- Up to four analog outputs/up to two switching outputs (relay)
- RS485 interface with Modbus protocol
- Operation directly on device or by using setup program on PC
- Ambient temperature -20 to +50 °C
- Protection type IP20

### Block diagram



### Approvals/approval marks

- cULus (Underwriters Laboratories) 902931/10, 230 V





## Are you familiar with the JUMO Wtrans series?

The wireless measuring probes for temperature, pressure, CO<sub>2</sub>, and humidity have multifunctional capability and offer numerous advantages.

### Your benefits in a nutshell:

- Wireless acquisition of measured values in moveable parts or areas which are hard to reach
- Enables measurements particularly at those locations where cable routing is not possible or where it would be technically problematic
- Suitable for permanent installation or temporary spontaneous measurements
- Complete spatial mobility (open air range up to 300 m)
- Unlimited flexibility for such uses as temporary measurements require no time-intensive mounting or installation
- Fail-safe, industry-standard data transmission for high

process reliability

- Up to 16 transmitters per receiver
- Reduced installation work
- Reduced costs for plant reinstallation, maintenance, and repair
- Durable high-performance battery
- Intuitive setup program for use on PC
- Optional online chart function enables recording of measured values directly on the PC
- Special applications can be implemented with the help of customer-specific linearization
- Easy connection of additional devices for evaluation of data

Further information can be found online at [www.jumo.net](http://www.jumo.net).



**JUMO Wtrans E01**  
Measuring probe for humidity, temperature, and CO<sub>2</sub>  
Type 402058



**JUMO Wtrans T**  
RTD temperature probe  
Type 902930



**JUMO Wtrans p**  
Pressure transmitter  
Type 402060



**JUMO Wtrans B**  
Programmable head transmitter  
Type 707060



**JUMO Wtrans receiver**  
Type 902931

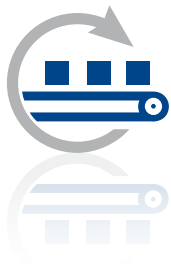


# Services & Support

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.



[www.jumo.net](http://www.jumo.net)

