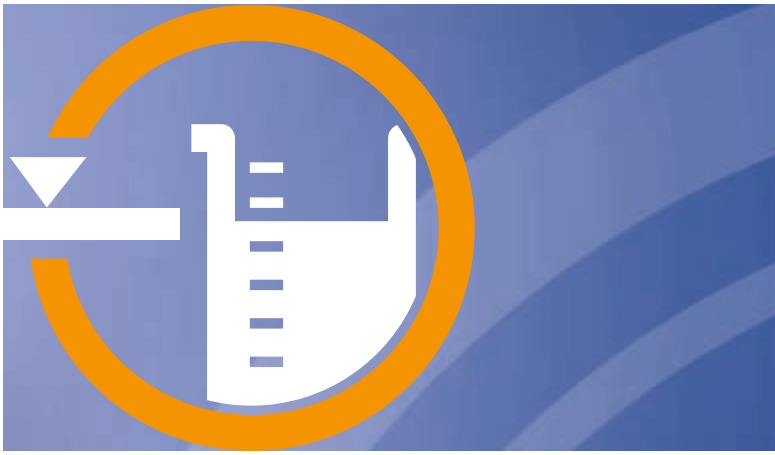
JUMO

MORE THAN SENSORS
AND AUTOMATION

Point Level and Level Measurement

Innovative solutions for the toughest requirements



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Dear Reader,

We wrote this brochure to provide the basics of point level and level measurement using hydrostatic and Archimedean measuring methods.

In the field of hydrostatic level measurement, JUMO can look back on solid experience with level probes and pressure transmitters. JUMO, with its own metal processing capability, is also a long-standing manufacturer of floats. We have used this expertise to implement a series of float switches and level transmitters with floats.

This brochure is intended to give you an overview and initial orientation about the different measuring principles of point level and level measurement. Of course we will assist you in selecting the most suitable product for your measuring task using an overview.

As JUMO not only supplies components but also systems, we can show you options with which complete measuring point solutions can be implemented. Due to our high vertical production depth, we can respond individually to your requirements so that we can achieve the ideal solution for your application together.

Our global sales structure as well as our reliable expert service provide support for you with every step that you take together with JUMO. This applies to all phases including product consultation, installation, calibration, or for questions during operation.

We view consistent product quality, a high degree of plant availability, and maximum cost effectiveness of your machines and plants as being at the heart of a successful collaboration. Consequently, we place the highest demands on ourselves by introducing, continuously assessing, and improving quality standards. One result of this philosophy is that the measuring devices are subject to thorough testing and detailed inspection at our own test laboratory.

The reliability that our products and staff ensure for our customers is another fundamental pillar of our family-run company.

Further information about our products can be found at www.jumo.net.

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Level probes

Level probes are used for continuous level measurement in ventilated tanks or to determine the level in open waters. The measuring principle is based on hydrostatic level measurement using relative pressure. This involves the complete immersion of the level probe in the liquid. Level probes are inserted through the container opening and can therefore be easily installed at a later point – without drilling and installation on the tank walls.

Continuous level measurement with level probes

Level probes continuously measure hydrostatic pressure. Here, the gravitational pressure of the liquid column located above the sensor is measured. This measuring principle allows the measurement of liquids and gases. The most commonly used units are meter water column (mH2O), bar, pound-force per square inch (psi), and megapascal (MPa). For the purpose of calculating the current fill level h, the formula

$$h = \frac{(p - p_0)}{(\rho \times g)} \text{ [m]}$$

is applied. In this formula, p represents the currently measured pressure, p0 stands for the ambient pressure, ρ denotes the medium density, and g constitutes the constant acceleration due to gravity. The formula refers to undisturbed liquids in containers or open waters.

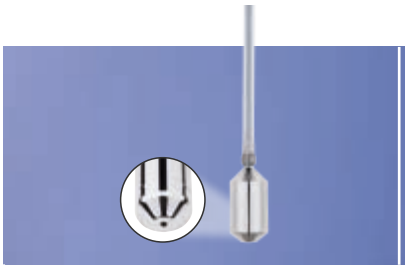
Advantages of level probes – JUMO MAERA

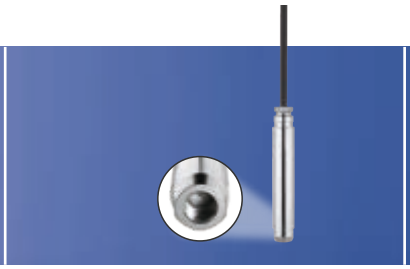
- Proven and widely-used hydrostatic measuring principle with a high degree of reliability as well as low maintenance
- Unaffected by conductivity, dust, foam, or steam
- Level measurement unaffected by container geometry and internal components
- Simply, subsequent installation from above in the measuring point
- Linear output signal to the fill level enables simple conversion
- High degree of chemical resistance due to availability of different materials
- Used in containers, tanks, basins, and water wells
- Level measurement possible up to 300 m

Calculation of hydrostatic pressure: $p = p_0 + \rho \times g \times h$

Product overview of level probes

✓ suitable/available
– not suitable/available

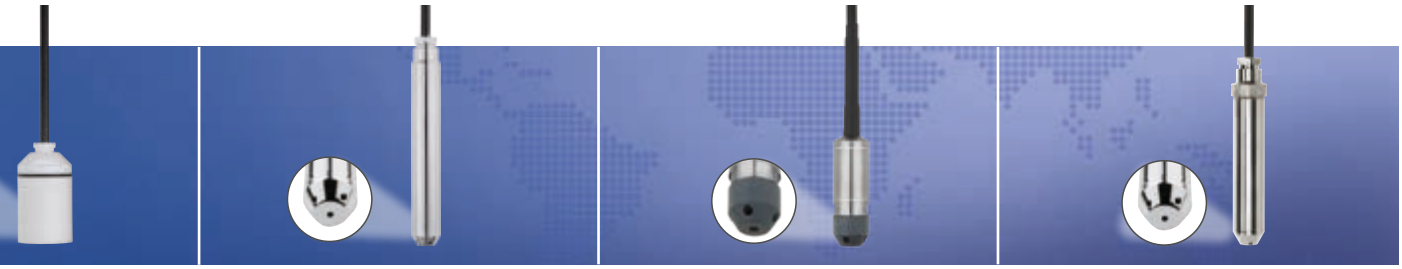




Product name	JUMO MAERA S25	JUMO MAERA S26	JUMO MAERA F27
Type	401015	402090	404391
Measuring range	2.5 to 10 mH2O 0.25 to 1 bar	2.5 to 25 mH2O 0.25 to 2.5 bar	0.5 to 16 mH2O 0.05 to 1.6 bar
Medium temperature	0 to 50 °C	0 to 50 °C	-20 to +60 °C
Sensor	Piezoresistive silicon sensor	Piezoresistive silicon sensor	Capacitive ceramic s
Accuracy (from the measuring span at 20 °C)	0.5 %	±0.3 % (> 2.5 bar) ±0.5 % (≤ 2.5 bar)	0.4 %
Output signal	4 to 20 mA, 2-wire 0 to 10 V, 3-wire 0.5 to 4.5 V, 3-wire 1 to 5 (6) V, 3-wire	0 to 20 mA, 3-wire 4 to 20 mA, 2-wire or 3-wire 0.5 to 4.5 V, 3-wire 0 to 10 V, 3-wire 1 to 5 (6) V, 3-wire	4 to 20 mA, 2-wire 0.5 to 4.5 V, 3-wire
Cable material	PE, PA	PE, FEP, PUR, EPR	PE, FEP, PUR
Housing material	Stainless steel	Stainless steel	Stainless steel or PT
Approval(s)	–	ACS, CSA	–
Temperature probe Pt100 (optional)	–	–	✓[2]
Outdoor mounting Indoor mounting	– ✓[1]	– ✓[1]	✓[1] ✓[1]
Integrated overvoltage protection	–	–	✓[2]

[1] These recommendations are based on many years of experience. However, in individual cases they may not be fully applicable. Please do not hesitate to contact us for further information and other applications.

[2] Only for stainless steel version with an output signal of 4 to 20 mA two-wire.



	JUMO MAERA S28	JUMO MAERA S29 SW	JUMO dTRANS p33
	404392	404393	404753
	2.5 to 100 mH2O 0.25 to 10 bar	1 to 100 mH2O 0.1 to 10 bar	2.5 to 100 mH2O 0.25 to 10 bar
	0 to 50 °C	0 to 50 °C	0 to 50 °C
sensor	Piezoresistive silicon sensor	Piezoresistive silicon sensor	Piezoresistive silicon sensor
	±0.3 % (> 2.5 bar) ±0.5 % (≤ 2.5 bar)	±0.5 to 1.2 %	±0.6 %
	4 to 20 mA, 2-wire	4 to 20 mA, 2-wire	4 to 20 mA, 2-wire
	PE, FEP, PUR, EPR	FEP, PUR	PE
FE	Stainless steel	Titanium or stainless steel	Stainless steel
	ACS	ATEX, DNV	ATEX
	✓	–	–
	✓[1] ✓[1]	– ✓[1]	– ✓[1]
	✓	–	–

Selection tool

Your path to the product

The "Level" checklist is a tool you can use to compile all the relevant requirements of your application in a clear and concise manner. This way, you benefit from efficient and fast sales quotation processing.

You can find the downloadable checklist on our website at **http://level-checklist.jumo.info** or simply scan the QR code.

Sensor (measuring cell) and housing

- Ceramic measuring cell with a high degree of robustness
- Metallic measuring cell for standard requirements
- Support in the right choice of materials for aggressive media

Cable (special cable)

- Different materials for different media and other influences such as solar radiation
- Automatic compensation of atmospheric pressure fluctuations and of temperature fluctuations

Process connection

- Closed systems and protective caps to protect against damage from solids
- Open systems for contaminated or viscous media and in case of possible deposit formation
- With thread for mounting the level probe on the tank bottom

Overvoltage protection

- Protection against lightning for outdoor applications

Integrated temperature probe

- For applications with temperature changes – since the density depends on the temperature, as a result of which the measurement accuracy also depends on the temperature measurement
- 2 measurands can be measured at only 1 measuring point

Accessories

Terminal case with pressure compensation element

The terminal case acts as a link between the end of the level probe cable and the cable to the downstream evaluation unit (such as a paperless recorder). The terminal case features protection type IP65.

Cable clamp

The cable clamp holds the level probe in a liquid at a defined depth. As a result, an individually suitable probe height above the tank bottom can be achieved during installation.

Pressure equalization hose

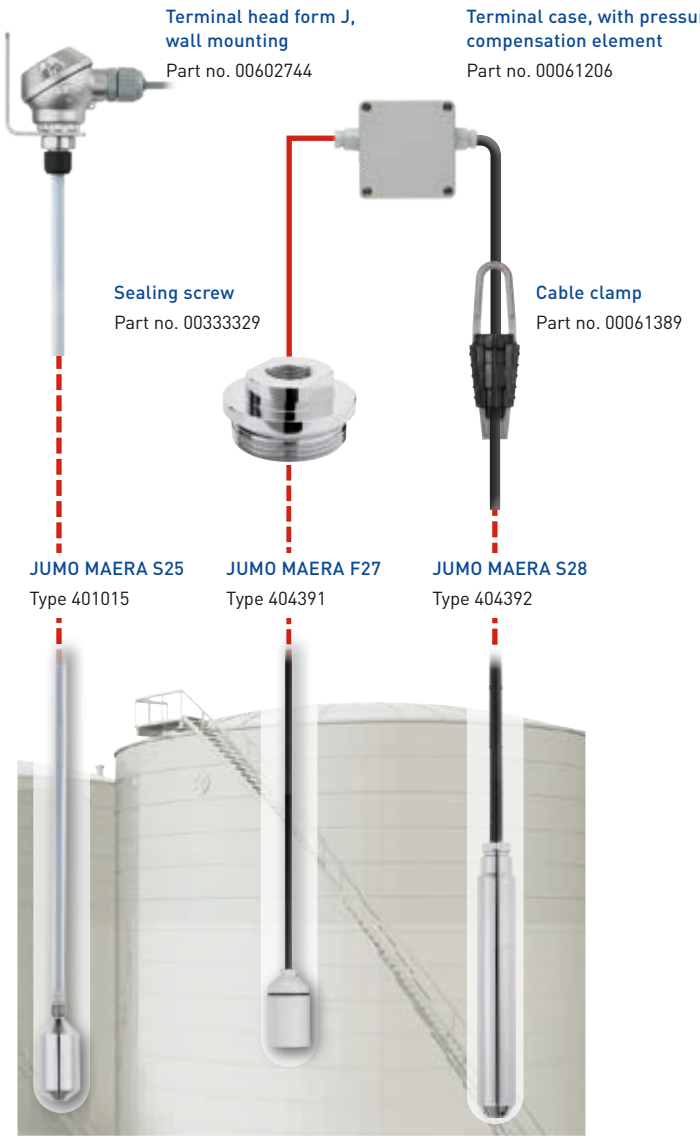
Pressure compensation is attained via a tube that is integrated in the cable. A pressure compensation filter prevents moisture from entering the tube so that measurement errors or even device failures can be avoided.

Sealing screw

The sealing screw acts as a cable passage and cable fastening for such applications as closed containers or water wells with a well head. It therefore contributes to a secure installation by protecting the cable sheath against damage.

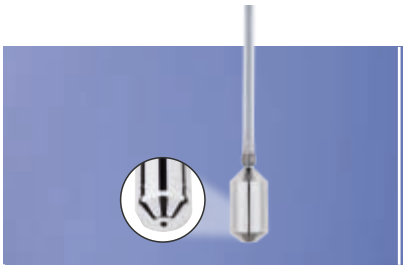
Terminal head

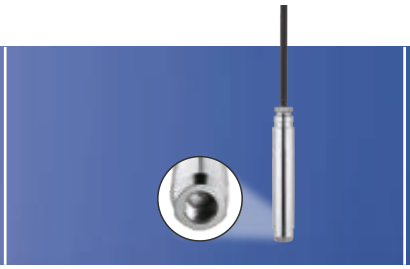
The terminal head is applied with the level probe JUMO MAERA S25 (type 401015). This terminal head is used to optimally mount the level probes and features protection type IP67. Tank cover and wall mounting variants are available.



Recommended use for level probes

✓ suitable
– not suitable





Product name	JUMO MAERA S25		JUMO MAERA S26		JUMO MAERA F27
Type	401015		402090		404391
	Probe	Cable	Probe	Cable	Probe
Wastewater	–	–	✓	FEP	✓
Well water (without salt content)	✓	PE	✓	PE	✓
Drinking water	–	–	✓[1]	PE	–
Heating oil	✓	PA	✓	FEP	✓
Motor vehicle washing plants	✓	PE	✓	PE	✓
Fuel: gasoline	–	–	–	–	–
Fuel: diesel	✓	PA	✓	FEP	✓
Seawater	–	–	–	–	✓[2]
Caustic soda (20 %, 20 °C)	–	–	✓[1]	PE	✓[1, 2]
Rainwater	✓	PE	✓	PE	✓
Sulphuric acid (50 %, 20 °C)	–	–	–	–	✓[2]
Swimming pool (disinfectant: chlorine)	–	–	–	–	✓[2]

✓ These recommendations are based on many years of experience. However, in individual cases they may not be fully applicable. Please do not hesitate to contact us for further information and other applications.

[1] Seal: EPDM.

[2] PTFE variant.

Point Level and Level Measurement

Recommended use – level probes




	JUMO MAERA S28		JUMO MAERA S29 SW		JUMO dTRANS p33	
	404392		404393		404753	
Cable	Probe	Cable	Probe	Cable	Probe	Cable
FEP	✓	FEP	✓	FEP	✓	PE
FEP	✓[1]	FEP	✓	FEP	✓	PE
–	✓[1]	PE	–	–	–	–
FEP	–	–	✓	FEP	✓	PE
FEP	✓	PE	✓	FEP	✓	PE
–	–	–	–	–	✓	PE
FEP	✓	FEP	✓	FEP	–	–
FEP	–	–	✓	FEP	–	–
PE	✓[1]	PE	✓	FEP	–	–
PE	✓	PUR	✓	FEP	✓	PE
PE	–	–	–	–	–	–
FEP	–	–	✓	FEP	–	–

Drinking water well application

Application

Mineral water producers or water suppliers must constantly and reliably monitor as well as control the groundwater level. To obtain mineral water or supply drinking water, water wells are drilled. Water is then removed from these wells using powerful pumps. However, this removal of water must not be performed arbitrarily, as this could cause long-term damage to the natural balance of the Earth's water cycle (the transport and storage of water).

In addition to the pump, level probes are therefore lowered into the water well or borehole to measure the groundwater level. If, in dry periods or in the event of excessive water removal, an insufficient amount of water is formed as a result of which the groundwater level falls below a specific limit value, measurements will quickly detect this state and the pump will be switched off. In regular operation, the removed volume of water is acquired using electromagnetic flowmeters such as JUMO flowTRANS MAG S01. This enables precise detection of the totalized flow rate or the flow velocity to ensure optimum use of the water well capacity.

A similar principle is also applied in mine shafts. In this context, however, water is pumped in as opposed to being removed. The water contributes to the stabilization of the shaft. It also protects people and nature against potentially fatal catastrophes. For these reasons reliable level measurement is also essential here.

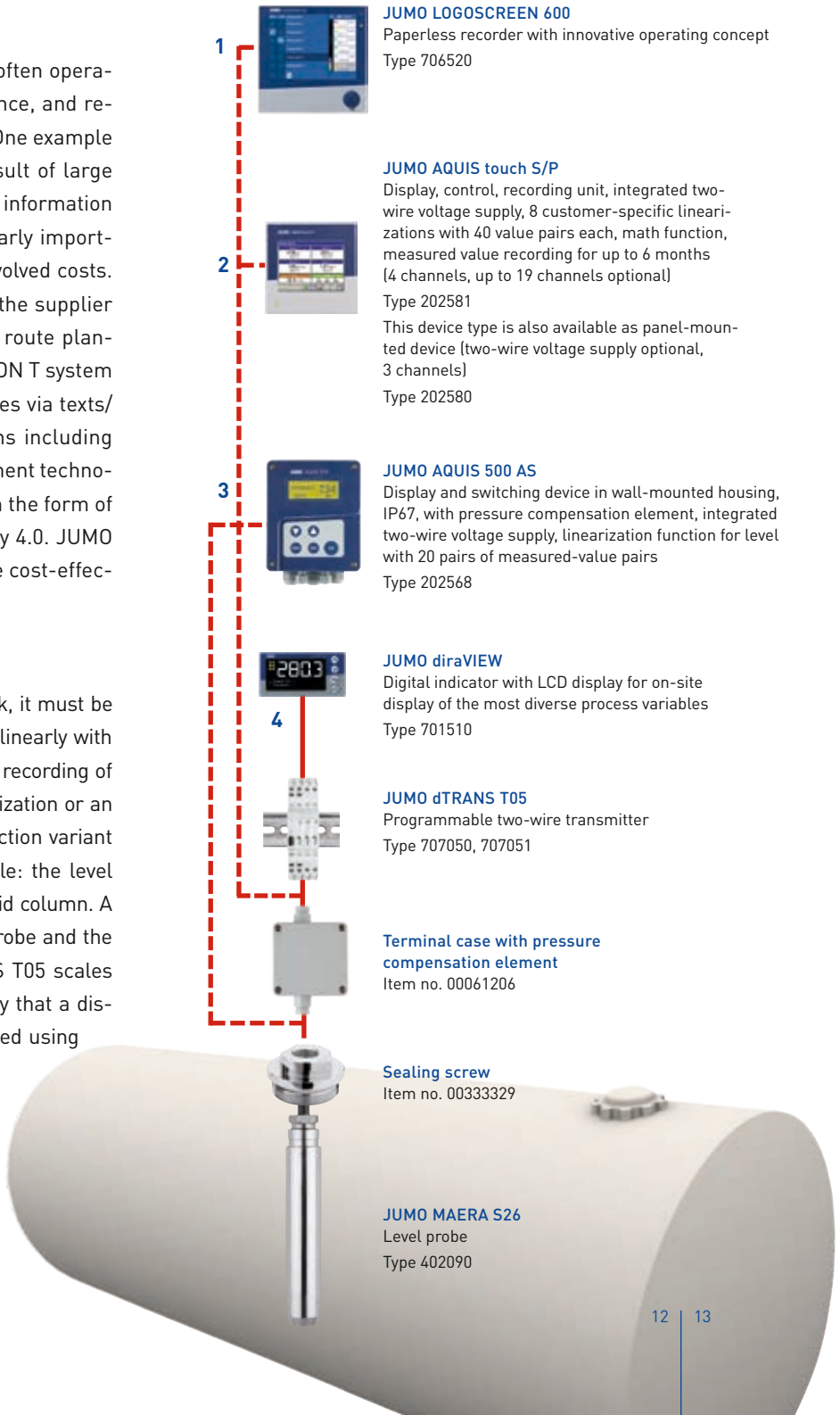
Diesel tank application

Application

In regions with poor infrastructure, plants are often operated using diesel engines. Operation, maintenance, and repair are particularly costly factors in this case. One example here is the filling of the diesel tanks. As a result of large distances between the individual plants, reliable information about the current level in the tanks is particularly important – for safe plant operation as well as the involved costs. For example, the correct information can help the supplier or your own personnel in performing efficient route planning for tank filling. In addition, our JUMO mTRON T system enables further options such as alarm messages via texts/emails as well as paperless recorder functions including web server. The connection of proven measurement technology and state of the art automation solutions in the form of inventory monitoring opens the door to Industry 4.0. JUMO level probes make a decisive contribution to the cost-effectiveness and secure availability of a plant.

Special case: horizontal tank

If a liquid is stored in a horizontal cylindrical tank, it must be considered that the fill volume does not change linearly with the fill level. To ensure a user-friendly display or recording of the measured values, a customer-specific linearization or an integrated math function can be applied. Connection variant 4 (see figure) is briefly explained as an example: the level probe measures the pressure caused by the liquid column. A terminal case acts as a link between the level probe and the JUMO dTRANS T05 transmitter. JUMO dTRANS T05 scales the corresponding standard signal in such a way that a display in liters or cubic meters can be implemented using JUMO diraVIEW.



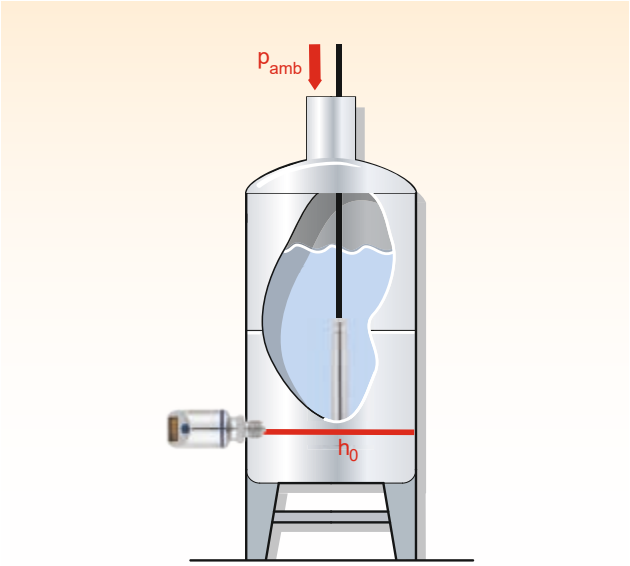
Pressure transmitter

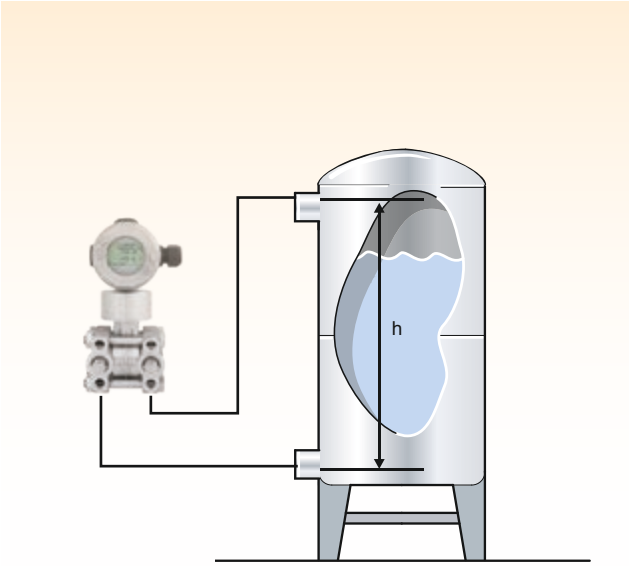
Pressure transmitters that are installed on the side wall or on the container bottom are also used for continuous level measurement in ventilated tanks and containers. Just like with level probes, the measuring principle is based on hydrostatic level measurement using relative pressure. For applications in closed or pressurized tanks, such as steam boilers, we offer differential pressure transmitters to determine the level.

Advantages of pressure transmitters

- Proven and widely-used hydrostatic measuring principle with a high degree of reliability as well as low maintenance
- Unaffected by conductivity, dust, foam, or steam
- Level measurement unaffected by container geometry and internal components
- Easy installation on the tank side walls or on the container bottom
- No cables in the medium that could hinder processes such as stirring
- High degree of chemical resistance due to availability of different materials
- Used in containers, tanks, basins, and water wells
- Level measurement in closed and pressurized systems using differential pressure transmitters

Continuous level measurement with pressure transmitters





Level measurement in ventilated containers and tanks

In open or ventilated containers and tanks the liquid has contact with the atmosphere. On the one hand, this means that the container is not pressurized. On the other hand, atmospheric pressure fluctuations have a direct effect on the measured pressure. As a result, a relative pressure transmitter can be used in this instance. It is directly mounted on the container wall. The minimum level h0 is measured as soon as the sensor membrane is covered with liquid.

Level measurement in pressurized containers and tanks

In closed containers and tanks no pressure compensation with the atmosphere takes place. Consequently, the pressure inside the container may be different than the pressure outside. This internal container pressure can be caused by such factors as fermentation processes or heat buildup. These applications require the installation of 2 pressure tapping points on the container. The level and the internal pressure – the total pressure – are measured at the lower tapping point, while the upper tapping point is only subjected to the internal pressure. The level must therefore not reach this point.

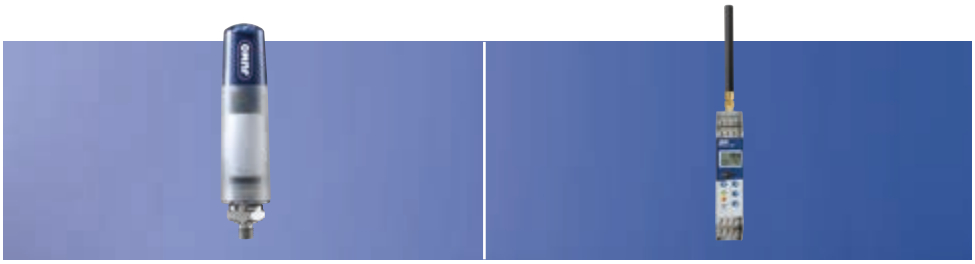
Product overview of pressure transmitters

			
Product name	**JUMO MIDAS S06** OEM pressure transmitter for low pressure applications, type 401011	**JUMO dTRANS ceramic** Pressure transmitter for small measuring ranges, type 404327	**JUMO TAROS S46 H** Hygienic pressure transm type 402071 **JUMO TAROS S47 P** Precision pressure transr type 402072
Materials in contact with the medium	Stainless steel (316L/304)	Aluminum oxide Al2O3 (99.9 %); Stainless steel 316Ti; FPM	402071: stainless steel (31 402072: stainless steel (31
Electrical connection	Attached cable, QUICKON, round plug M12 × 1, bayonet connector, line socket	Attached cable, round plug M12 × 1, line socket, terminal head	Attached cable, round plug socket, terminal head
Measuring range	0.1 to 0.6 bar relative	0.05 to 1 bar relative	0.1 to 100 bar relative; 0.6 to 40 bar absolute
Medium temperature	-20 to +100 °C	-20 to +80 °C	402071: -40 to +125 °C (up 1 h / day) 402072: -40 to +125 °C
Protection type	IP65 to IP67 (depending on the electrical connection)	IP65 or IP67 (depending on the electrical connection)	IP65 to IP69 (depending on connection)
Accuracy[1]	0.7 to 1.2 %	0.3 to 0.5 %	0.25 to 0.75 %
Output	4 to 20 mA, 2-wire; 0 to 10 V, 3-wire; 0.5 to 4.5 V, 3-wire; 1 to (5)6 V, 3-wire	4 to 20 mA, 2-wire; 0.5 to 4.5 V, 3-wire	4 to 20 mA, 2-wire; 0 to 10 1 to 5 V, 3-wire; 1 to 6 V, 3-
Process connection	Commercially-available process connections	Commercially-available process connections	402071: clamp, VARIVENT® 402072: thread
Approvals	–	–	402071: EHEDG
Special features	QUICKON quick-clamp technology	Precise measurement of small measuring ranges	Simple zero point correctio a magnet 402071: electrolytically poli Ra ≤ 0.4 µm; FDA-compliar autoclavable version
Application areas	Industry; air conditioning and refrigeration technology; compressors; power-heat cogeneration; medical technology; packaging and bottling	Industry; mechanical and plant engineering; gearbox construction; chemical processes; semiconductor industry	402071: food industry; CIP plications; sterilizers and a pharmaceutical, medical, a logy; hygienic applications; construction 402072: plant and mechani pump construction; steriliz ment construction; calibrat laboratories

[1] From the measuring span at 20 °C, values depend on the selected measuring span.

itter, mitter,	**JUMO DELOS SI** Precision pressure transmitter, type 405052	**JUMO dTRANS p20 DELTA** **JUMO dTRANS p20 DELTA Ex d** Process pressure transmitter, type 403022/23	**JUMO dTRANS p20** **JUMO dTRANS p20 Ex d** Process pressure transmitter, type 403025/26
6L) 6L, 316Ti)	Stainless steel (316L)	Stainless steel (316L); HASTELLOY® C276; tantalum	Stainless steel (316L/17-4PH); HASTELLOY® C276
M12 × 1, line	Round plug M12 × 1	Cable fitting	Cable fitting
	0.4 to 60 bar relative 0.4 to 60 bar absolute	-0.01 to +0.01 bar DP -1 to +100 bar DP	1.2 to 600 bar relative 0.6 to 100 bar absolute
to 140 °C for	-25 to +200 °C	-40 to +110 °C	403025: -40 to +200 °C 403026: -40 to +115 °C
the electrical	IP67	IP66	IP66
	0.25 to 0.35 %	0.1 to 0.2 %	0.08 to 0.24 %
V, 3-wire; wire	1× PNP switching output; 2× PNP switching output; 1× PNP switching output and 1× analog output (0(4) to 20 mA or 0 to 10 V)	4 to 20 mA, 2-wire; HART®	4 to 20 mA, 2-wire; HART®
®, JUMO PEKA	Thread, hygienic connections, diaphragm seals, JUMO PEKA	2 × 1/4-18 NPT; diaphragm seal	Thread; hygienic connections; JUMO PEKA; diaphragm seals
	EHEDG	EAC, SIL 403022: [Ex ia] (ATEX, EAC Ex) 403023: [Ex d] (ATEX, EAC Ex)	EAC, EHEDG, SIL 403025: [Ex i] (ATEX, EAC Ex), DNV 403026: [Ex d] (ATEX, EAC Ex)
on using ished, nt materials,	Programmable; measuring range scaling 1 : 4; selectable measuring unit	Programmable; stainless steel case; measuring range scaling 1 : 400, selectable measuring unit	Programmable; stainless steel case; measuring range scaling 1 : 50, selectable measuring unit
and SIP ap- utoclaves; nd biotechno- test equipment cal engineering; ers; test equip- tion technology;	Food industry; pharmaceutical technology; CIP and SIP systems; mechanical and plant engineering; refrigeration and air conditioning engineering; hydraulic units	Food industry; pharmaceutical technology; power plant technology; process technology	Process technology; food industry; pharmaceutical technology

Wireless pressure transmitter



Product name	JUMO Wtrans p Pressure transmitter with wireless measured value transmission	JUMO Wtrans p Receiver
Type	402060	902931
Materials in contact with the medium	316L/17-4PH, 316Ti	–
Electrical connection	–	Screw terminals
Measuring range	0.25 to 600 bar relative.; 0.6 to 25 bar absolute	Radio signal by transmitters
Medium temperature	-30 to +85 °C	–
Protection type	IP66 or IP67	IP20
Accuracy[1]	0.5 to 0.7 %	–
Output	Radio signal to receiver	2 or 4 analog outputs: (0)4 to 20 mA or 0 to 10 V; 2 relay outputs; RS485 (Modbus)
Process connection	Thread; JUMO PEKA	–
Voltage supply	Lithium battery 3.6 V	AC 110 to 240 V; AC/DC 20 to 30 V
Approvals	EHEDG	–
Special features	Wireless transmission of measured values; high degree of moisture and vibration protection; online chart function for recording measured values on the computer	Wireless reception of up to 16 measured values; simple operation and configuration via keys and display or setup program; compatible with all JUMO Wtrans sensors (temperature and humidity)
Application areas	Mechanical and plant engineering; food industry; pharmaceutical technology; chemical industry; plastics industry; building technology	
Frequency	868.4 MHz	868.4/915 MHz
Transmission interval	0.5 to 3600 s	–
Range	Up to 300 m when using the receiver antenna holder for wall mounting and with 3 m antenna cable	

[1] From the measuring span at 20 °C, values depend on the selected measuring span.

CIP plant application

The situation

CIP (Cleaning in Place) cleaning is the standard cleaning method in food and beverage production. The exact combination of influencing factors and time makes cleaning a reproducible process. These factors include temperature, chemical concentration, turbulent flow, and the conductance of the reverse flow. In addition to these, the level in the tanks must, of course, also be monitored.

The challenge

The fill level must be measured in all CIP tanks to ensure the availability of acid, lye, and water. A limit value monitoring function and switching functions can be used to switch such devices as valves or pumps to regulate the amount of fluid.

The solution

The JUMO DELOS SI pressure transmitter reliably measures the level. The value can be read on site at any time via the LCD display. In addition, JUMO DELOS SI is a pressure switch that can do such things as switch a pump on or off via minimum and maximum values. This way, the correct filling height in the acid, lye, and water tanks of the CIP plant is ensured.

Float switches and level transmitters

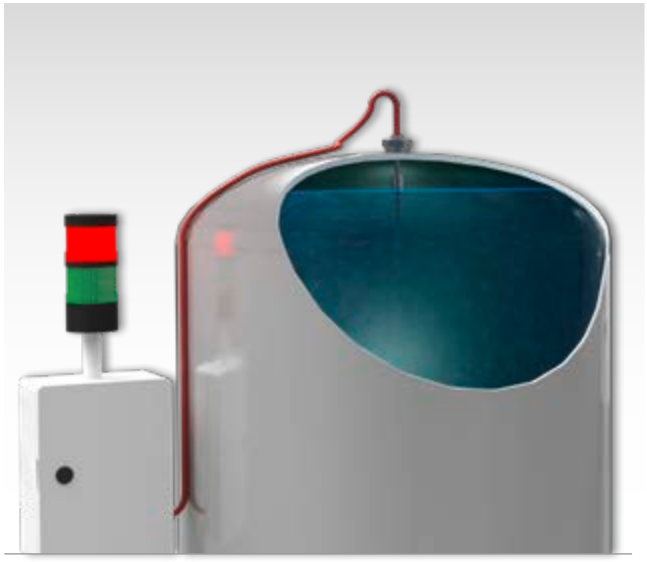
Float switches are applied for point level measurement while level transmitters with float are used for quasi-continuous level measurement of liquids. The measurement takes place according to Archimedes' principle and is suitable for unpressurized and pressurized tanks.

Quasi-continuous level and point level measurement using floats

Point level and level measurement is carried out according to Archimedes' principle for liquids. As the level rises or falls, the float moves along the guide tube. With its magnetic field the magnet in the float actuates the reed contact – or several contacts – installed in the guide tube. Depending on further switching signal processing and application the switching functions normally open contact, normally closed contact, changeover contact, or bistable response are available. Further reed contacts allow the transfer of additional information pertaining to "full" or "empty" reporting in the process. Mounting generally takes place from above or from below via the thread or a flange in the tank. Curved or horizontal design types allow side mounting (JUMO NESOS R04 and JUMO NESOS R40). The level transmitter is used to transmit levels of tanks and containers with a quasi-continuous standard signal. Instead of a reed contact, a reed chain and head transmitter are used for the interpretation of the level. Approvals in explosion protection (intrinsically safe and flameproof enclosure), for railway technology, shipbuilding, and overfill protection according to the Water Resources Act are available for applications with special requirements.

Advantages of the float switch and level transmitter – JUMO NESOS

- Proven measurement method with robust technology and low maintenance
- High-quality floats from our own production with quality "Made in Germany"
- Customer-specific solutions can be implemented due to a high degree of production depth
- Point level and level measurement unaffected by container geometry
- Unaffected by many media properties: foaming, conductivity/permittivity (ε), pressure, vacuum, steam, or condensation have no influence
- Use in industrial, process, and process engineering applications
- Quick error check when servicing
- High degree of chemical resistance due to availability of different materials
- Point level measurement for input control of PLC, valves, signals, motors, or pumps
- Level measurement with low filling heights 0.1 to 4 m



Point level measurement via float switch

Level measurement via level transmitter

Product overview of float switches and level transmitters

✓ available
– not available

Product name	JUMO NESOS R01 LS and JUMO NESOS R02 LS Float switches in miniature and standard version	JUMO NESOS R03 LS Float switch with chamber
Type	408301/02	408303
Approval	EAC, UKCA, ATEX, IEC Ex, EAC Ex, CCC, UKEX, DNV, railway industry (DIN EN 50155), WHG	EAC, UKCA, DNV
Temperature sensor (optional)	✓	✓
Temperature switch (optional)	408301: – 408302: ✓	✓
On-site display (optional)	–	–
Guide tube length (max.)	0.5 m (408301); 4 m (408302)	0.11 m
Medium temperature	-52 to 240 °C	-30 to +150 °C
Sensor	Reed contact	Reed contact
Accuracy	±2 mm (switching point)	±2 mm (switching point)
Output signals	Up to 4 switching contacts (408301); up to 5 switching contacts (408302)	Up to 2 switching contacts
Switching function	SPST-NO, NO contact; SPST-NC, NC contact; SPDT-CO, changeover contact; SPST-NO, NO contact bistable	SPST-NO, NO contact; SPST-NC, NC contact; SPDT-CO, changeover contact
Materials in contact with the medium	Stainless steel AISI 316; stainless steel AISI 316 and titanium	Aluminum, AISI 316, zinc-plated steel
Process connection	Thread, flange	Chamber with compression fitting
Electrical connection	Cable, cable with connector, line socket, round plug M12 × 1, connection housing	Connection housing

[1] also as temperature transmitter with 4 to 20 mA

Point Level and Level Measurement

Product overview – float switches and level transmitters

JUMO NESOS R04 LS Float switch in bend version	**JUMO NESOS R20 LT** Level transmitter using a float	**JUMO NESOS R40** Horizontal float switch
408304	**408320**	**408340**
EAC, UKCA, ATEX, IEC Ex, EAC Ex, CCC, UKEX, WHG	EAC, UKCA, ATEX, IEC Ex, EAC Ex, UKEX, DNV, railway (DIN EN 50155)	EAC, UKCA, ATEX, IEC Ex, EAC Ex, CCC, UKEX, DNV, WHG
✓	✓[1]	✓
✓	✓	✓
–	✓	–
0.06 to 0.2 m horizontal; 0.08 to 2 m vertical	4 m	1 m
-52 to 240 °C	-52 to 180 °C	-52 to 240 °C
Reed contact	Reed chain	Reed contact
±2 mm (switching point)	Up to 5.5 mm (resolution)	–
Up to 4 switching contacts	4 to 20 mA, HART®, resistance value, potentiometric	2 switching contacts
SPST-NO, NO contact; SPST-NC, NC contact; SPDT-CO, changeover contact; SPST-NO, NO contact bistable	–	SPST-NO, NO contact; SPDT-CO, single pole changeover contact
Stainless steel AISI 316; stainless steel AISI 316 and titanium	Stainless steel AISI 316; stainless steel AISI 316 and titanium	Stainless steel AISI 316
Thread, flange	Thread, flange	Thread, flange
Cable, cable with connector, line socket, round plug M12 × 1, connection housing	Cable, cable with connector, line socket, round plug M12 × 1, connection housing	Cable, cable with connector, line socket, round plug M12 × 1, connection housing

Recommended use for float switches and level transmitters

✓ suitable
– not suitable

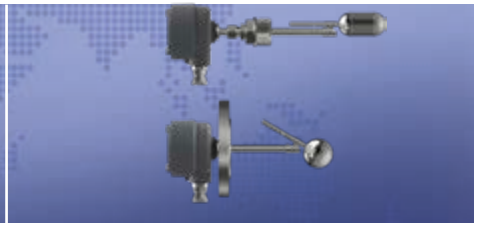
Product name	JUMO NESOS R01 LS and JUMO NESOS R02 LS Float switches in miniature and standard version	JUMO NESOS R03 LS Float switch with chamber
Type	408301/02	408303
Wastewater[1]	✓	✓
Drinking water and rainwater	✓	✓
Coolant	✓	✓
Mineral and transformer oil	✓	✓
Fuel: gasoline	✓	–
Fuel: diesel	✓	✓
Sodium hydroxide (20 %, 20 °C)	✓	–
Nitric acid (50 %, 20 °C)	✓	–
Sulphuric acid (5 %, 20 °C)	✓	–
Toluol (solvent)	✓	✓
Acetone (20 °C)	✓	✓
Ammonia (50 °C)	✓	✓

[1] Without components that could damage or immobilize the float

These recommendations are based on many years of experience. However, in individual cases they may not be fully applicable.
Please do not hesitate to contact us for further information and other applications.

Point Level and Level Measurement

Recommended use – float switches and level transmitters



JUMO NESOS R04 Float switch in curved version	JUMO NESOS R20 LT Level transmitter using a float	JUMO NESOS R40 Horizontal float switch
408304	408320	408340
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
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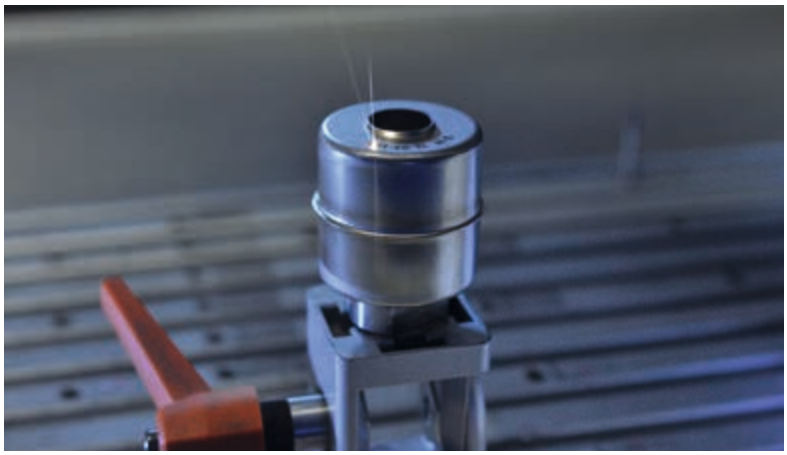


Tempering equipment application

The situation

Tempering equipment is used, for example, for thermal regulation of tools in the mechanical production of plastics. Reliable thermal regulation within the device is required to bring the tools to a certain operating temperature or to cool them down again after use. Tempering equipment usually consists of liquid containers, a circulation pump, a heater, a heat exchanger, and temperature controller.

The challenge

A safe and smooth process means that the tempering equipment heats or cools the tools to avoid plant failure or dangerous situations such as fires. Other than temperature control, a wear-free solution for level measurement is also required as the container is built in the tight machine housing where access is difficult. For this reason, the device for level measurement must be low-maintenance and less complex – should maintenance or repair ever be required.

The solution

The filling of the tank occurs using the float switch in miniature form JUMO NESOS R01 LS with cable and ready-for-use connector. The switching contacts of the float switch are usually designed as normally open contacts for a rising level. Through these the filling valve in the tempering system opens during automatic filling until the contact reports "full". The mechanical measuring principle via float switch – meaning that the switching operation takes place without contact or auxiliary energy – ensures that reliable measurement takes place.

Level has reached minimum

Level optimal in operation

Point Level and Level Measurement

Application examples – float switches and level transmitters

Gasoline tanks application

The situation

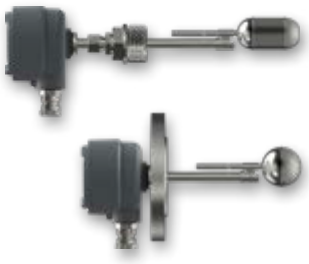
In gasoline tanks, the level is measured for inventory and demand planning. Another essential aspect for the plant operator is that the system reacts immediately when certain levels are exceeded or not reached (e.g. by switching pumps or alarms). The switching signals must be passed on safely.

The challenge

Some tank installations cannot be accessed from above. As a result, only the tank side walls are available for installation. Of course, only measuring technology with Ex approval can be used in this potentially explosive environment. Its line must be separated from other electrical circuits.

The solution

The horizontally positioned JUMO NESOS R40 LSH float switch is simply mounted on the tank side wall. Due to 2 possible switching contacts, it can independently switch corresponding devices such as alarms or pumps. The float switch can also be produced with a temperature switch or probe (Pt100 or Pt1000) for optional temperature measurement. Due to the Ex approval, JUMO NESOS R40 LSH can be used in zone 0. The JUMO Ex-i isolating switching amplifier is used to amplify and protect the switching signal. The device can even be installed in Ex zone 2 and provides safe isolation of the electrical circuits as well as amplification of the switching signal. Its 2 channels allow 2 switching signals to be transmitted. Depending on the requirement, these can be 2 float switch contacts or the signals from the float and temperature switch.



JUMO NESOS R40 LSH
Float switches in horizontal version
Type 408340

JUMO Ex-i isolating switch amplifier
Two-channel isolating switch amplifier for Ex applications
Type 707540

Capacitive Level Switch

The capacitive level switch identifies the level of liquids and solids. It can also be used in pressurized tanks or pipes. Typically, the level switch is used in industrial environments for applications with requirements for overflow and dry-run protection or for media detection (such as sludge in separation processes).

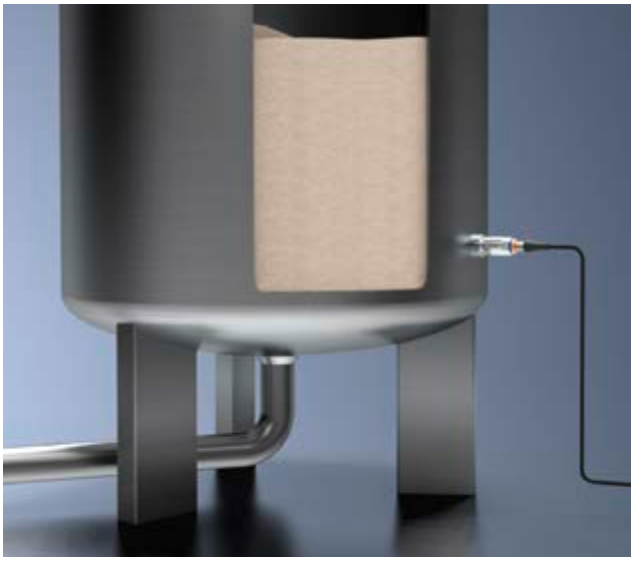
Capacitive point level measurement

The point level measurement is carried out according to the capacitive measuring principle. The sensor detects a change in the electric field when a medium approaches the PEEK tip. The physical signal is processed and converted into electrical signals that can be evaluated. Typically valves, PLC inputs, or warning signals such as dry running of pumps are controlled. Liquids or solids can be used as a medium. From an application point of view, mixed forms or separating layers (such as between beer and foam) can also be detected. The capacitive level switch ensures ideal availability of your plant with its reliable and tested design. As part of the miniaturization and digitization trend within the field of sensor technology, the level switch ideally supports customer requests to implement more compact plants. The IO-Link interface and support of the latest profiles allow the level switch to minimize downtimes because the sensor can be updated through the firmware update profile even when installed. Approvals are available for applications with special requirements in explosion protection (intrinsically safe, [Ex i]), overfill prevention according to WHG, hygiene (FDA, 3A, EHEDG), railway technology, and shipbuilding. Country-specific requirements according to UL are also available.

Other advantages

- Proven, maintenance-free measuring principle
- Customized solutions and configurations can be implemented
- The unique autocalibration permanently recalibrates the product in the installed state
- PEEK tip functions as an integrated seal to reduce installation effort and facilitate easy handling
- Can be mounted with standard torque wrench SW22
- Standardized and extensive configuration via IO-Link (no proprietary solution)
- Can also be set on site to specific medium through permanent magnet ("Teach-In") without software
- Detects cleaning media or foam to support ideal production process
- Antivalent electrical circuit enables detection of line faults such as a short circuit or cable break
- Suitable for CIP and SIP processes

Overflow and dry run protection for liquids in pressurized tanks



Idle signal for powdery solids

Product overview of the capacitive level switch

✓ available
– not available

Product name	JUMO ZELOS C01 LS Capacitive level switch
Type	408401
Approval	Railway technology [DIN EN 50155], DNV, ATEX, IEC Ex, WHG, UL, FDA, 3A, EHEDG
Autocalibration function	✓
Status display	According to IO-Link, NE107, or customized to meet customer requirements
Self-monitoring / diagnostic message	According to NE107 and VDI/VDE 2650
Medium temperature	-40 to +200 °C
Sensor	Capacitive
Repeatability and hysteresis	+/- 1 mm
Output signals	PnP, nPn, push-pull, or IO-Link
Switching function	Antivalent circuit, normally open contact, normally closed contact
Materials in contact with the medium	PEEK PEEK, FKM, 316L for variants with sliding connection
Process connection	Thread, JUMO PEKA
Electrical connection	M12, cable
Protection type	IP67 / IP69

Recommended use of the capacitive level switch

✓ suitable
– not suitable

Product name	JUMO ZELOS C01 LS Capacitive level switch	
Type	408401 with thread	408401 with sliding connection
Wastewater	✓	✓
Drinking water	✓	–
Sand	✓	✓
Mineral and transformer oil	✓	–
Fuel: gasoline	✓	✓
Fuel: diesel	✓	✓
Sodium hydroxide (20 %, 20 °C)	✓	–
Nitric acid (30 %, 20 °C)	✓	✓
Sulphuric acid (5 %, 20 °C)	✓	✓
Toluol (solvent) (20 °C)	✓	–
Acetone (20 °C)	✓	–
Ammonia (20 °C)	✓	✓
Honey	✓	✓
Hydrogen peroxide (20 °C)	✓	✓

These recommendations are based on many years of experience. However, in individual cases they may not be fully applicable.
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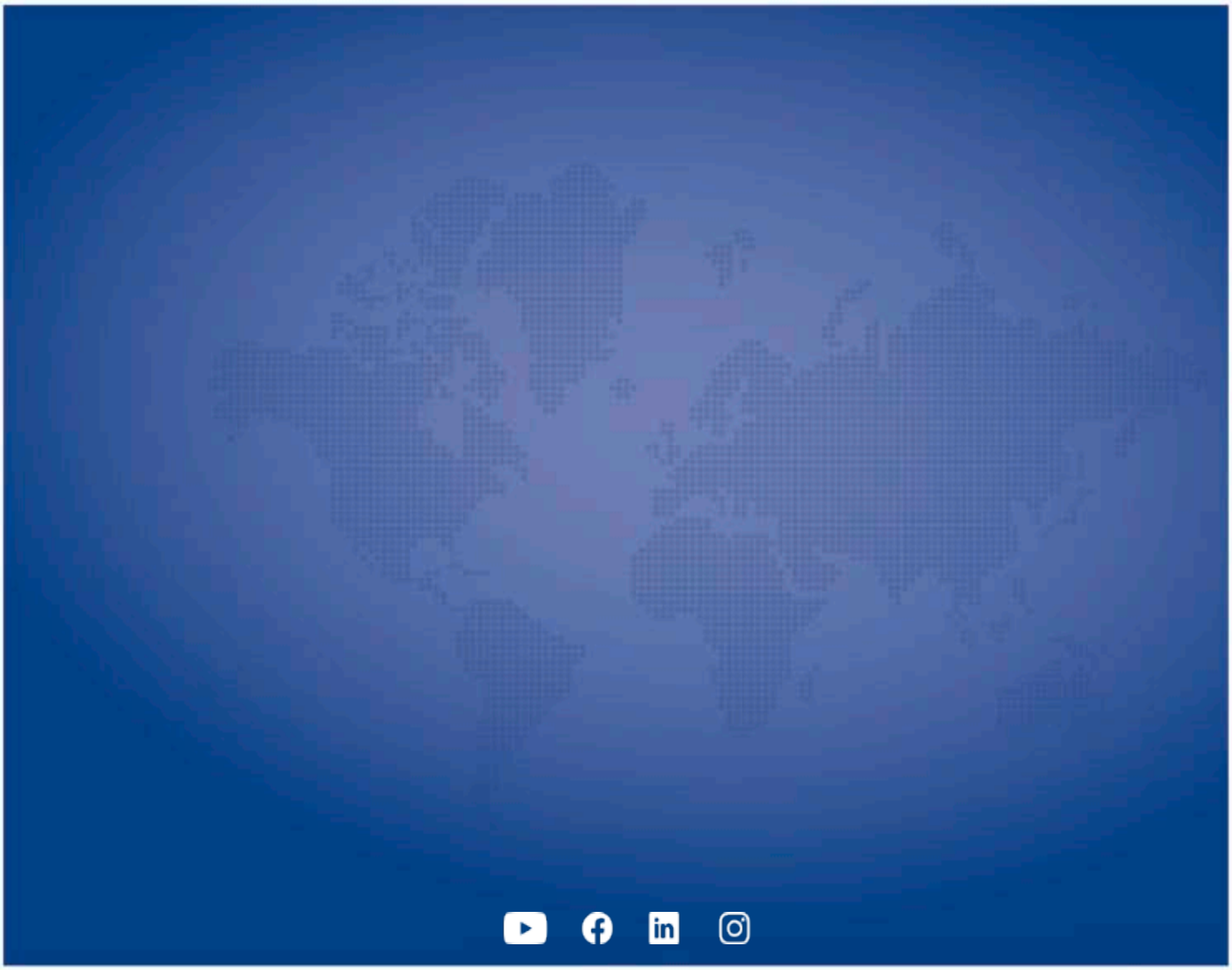

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