

Level Control in Bulk Solids News and Technical Developments



Whitepaper

Betzigau, April 2012

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1. Introduction

Today, bulk solids are usually transported in closed, contained systems. Whether the product is flour, coffee beans, inorganic materials such as sand and Aerosil or the suspension of solids within liquids, the operator must always be able to accurately determine the level of the product within the container. As a measuring device that works reliably and independent of external influences and is easy to install, rotating paddle switches and vibration sensors are well proven in practice.

It is often difficult to find a suitable level control device for your solids silo. Bulk solids are moist, dusty, abrasiv and cause many more challenges in practice. The setup of the device can be complicated and costly in time spent in parameter setting and installation. Rotary paddle switches and vibration forks have proven themselves in practice as being reliable level control devices that work independently of external influences as well as being easy in their handling.

The operation principles are simple in theory, and in practice these principles depend on subtle differences in technical developments. The following guidelines address these technical developments to allow for completely accurate and reliable level measurement of bulk materials.





2. New for Rotary Paddle Switches

Principles of operation:

A motor drives a shaft mounted on to a paddle. If the bulk material to be measured reaches the paddle, the rotation of the paddle will be halted by the resulting torque. The reaction is converted into an output signal and the motor is switched off. When the paddle is released by the declining level of the bulk solid, the output signal changes and the motor restarts.

EHEDG - Certification

The chemical, pharmaceutical and food industries are subject to very strict legal requirements and guidelines regarding hygienic processes. Cleanliness, disinfection and maintenance are key factors in the production of material within these industries. This also applies to level control devices where contamination could be caused by product design. The paddle switch has been designed so that there is no 'dead space' within the unit where material could accumulate. In addition, the surface material and smoothness is suitable for food production applications. The use of an FDA compliant gasket means that the device is entirely suitable for contact with foodstuffs. Plus the process connection and shaft are available in high-quality stainless steel (316L) which heightens the resistance to abrasion in processes where optimum hygiene environments are paramount. These additional options are available for full, demand or empty level switches.



The benefits for plant operators are minimal down times for cleanliness and maintenance resulting in the fact that long-term processes are optimized and made more efficient. The use of disinfectants and cleaning agents is also considerably reduced.



2. New for Rotary Paddle Switches

PNP electronics

The new PNP electronics for the Rotonivo[®] 3000 and Rotonivo[®] 4000 ranges use 3-wire electronics technology with a non-contact output, open collector, PNP. The maximum output current is 0.4 A.

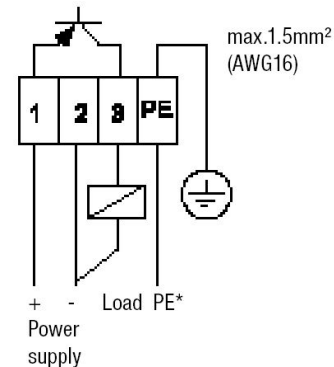
These electronics can be connected to any standard PLC with 24V DC power supply and PNP input card. The detection signal - the sensor switched to either 'full/occupied' or 'empty/unoccupied' - is not via micro switches as in the past, but by using Hall sensors. Via two potentiometers, both detection signals 1 and 0 can be time delayed. Additionally, a jumper can be switched between FSH and FSL. Heating protection has been installed in the electronics in order for the device to be used in temperatures of less than -20°C.

Power supply:

24V DC $\pm 15\%$ ⁽¹⁾
⁽¹⁾ including $\pm 10\%$ of EN 61010
Input current: max. 0.6A

Signal output:

Load max.0.4A
Output voltage equal to input voltage, drop <2,5V
Open collector
Protected against short circuit and overload





2. New for Rotary Paddle Switches

Universal voltage electronics

Every electronic unit is designed with an operating voltage set by the manufacturer. Due to a great variety in voltages, adaptability to international usage can be complicated. Ideally, international companies need to be able to easily integrate their systems all over the world.

The Rotonivo® series of rotary paddle switches are available without jumper and microswitch. Integrated heating comes from the pulsed DC which maintains the temperature even if the unit is switched off. Thus, the mounting of an external heating resistor is no longer required. The heating function switches off at the sufficient ambient temperature level.

Universal voltage electronics is available for all worldwide established mains voltages as well as for 24V DC. The advantages are fluent project execution and installations especially for international companies, the need for fewer spare parts and thus simplified warehousing.

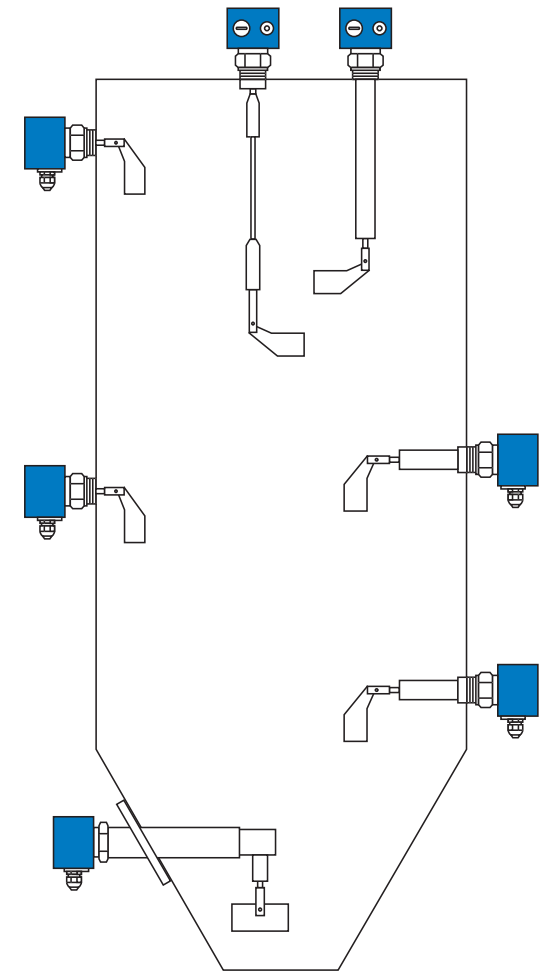


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2. New for Rotary Paddle Switches: Technical details ROTONIVO® 3000/6000

Housing	Aluminium IP66 (Type 4)
Pressure range	-0,8 up to +10bar (-10.4 up to +145psi)
Supply voltage	Universal Voltage electronic AC: 24V or 48V or 115V or 230V DC: 24V
Signal output	Microswitch SPDT contact Microswitch DPDT contact
Certificates	ATEX II 1/2D and II 2G FM Cl. I, II, III, Div.1 Gr. A-G; Zone 1 CSA Cl. I, II, III Div.1 Gr. B-G; Zone 1, GOST-Ex, RTN Ex, IEC Ex, EHEDG
Process Temperature range	-40°C up to +600°C (-40°F up to + 1112°F)
Bearing	Encapsulated ball bearing with shaft sealing
Process connection	G1, 1½ and 1¼ inch, NPT1½ and 1¼ inch; M30x1,5 and M32x1,5; Flange DN100 PN16, other flanges available
Material Process connection	Aluminium or stainless steel 1.4035 (SS303) or 1.4404 (316L)
Material measuring vane and shaft	Stainless steel 1.4301 (SS304) or 1.4305 (SS316) or 1.4404 (316L)



Assembling options for series ROTONIVO®

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3. New for Vibrating Forks

Principle of operation:

The vibrating probe is stimulated by a piezo and oscillates at its mechanical resonance frequency. If the probe comes into contact with material, the oscillation is dampened and this is electronically registered, and sent out as a signal. Once the probe is no longer in contact with material, the probe can oscillate again and a new output signal is generated.

VIBRANIVO[®] 1000

The fork with a length of 165mm is designed for heavy and dense conditions, such as in the measurement of sand, rock and salt or for the measurement of solids within liquids (water). The short fork means there is little exposure to the material meaning that the mechanical stress on the device is reduced. In addition, this sensor is particularly suitable for installation within confined spaces (such as within downpipes) and the ingenious design eliminates the risk of bridging.

- Measuring frequency 350Hz
- ATEX / IEC Ex according to the latest IEC 60079 series of standards
- Sensitivity of >50 g/l
- EHEDG certification for use within hygienic environments





3. New for Vibrating Forks

VIBRANIVO[®] 2000

The measuring fork with a length of 235mm is ideally for very light material, such as amorphous silica (Aerosil) or pyrogenic silica. Also pneumatically conveyed, fluidized solids can be detected and measured despite their lightness. The surface roughness of the fabricated steel shaft of Vibranivo[®] 2000 is 0.75 microns. As a result, the device meets the stringent requirements, for example, in the chemical, pharmaceutical and food industries. This level of surface roughness prevents adhesion, and colonisation by microbe on the device and ensures the necessary sterile standards are met.

- Sensitivity of >20 g/l
- Optional <5 g/l
- EHEDG certification for use in hygienic environments
- ATEX / IEC Ex
- Surface roughness of 0.75 micron as standard



3. New for Vibrating Forks

VIBRASIL[®]

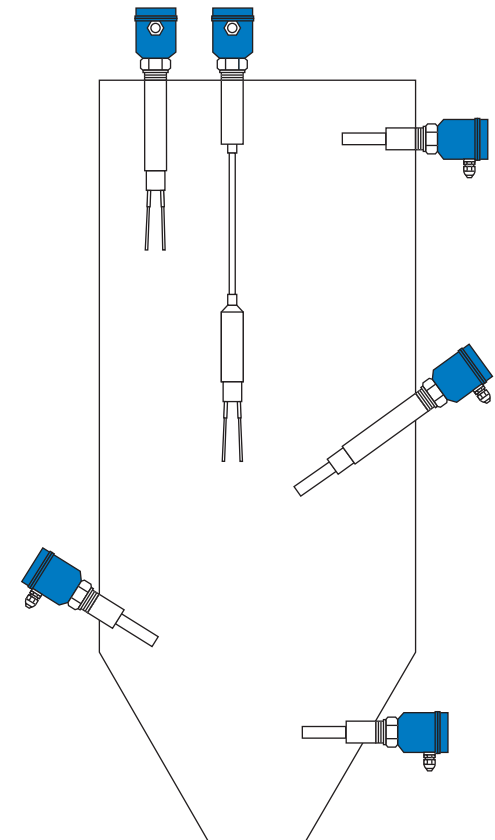
This device meets the particular technical requirements in the measurement of products such as silica whose properties (bulk density) may change when during emptying, dosing, transport etc. Silica has a resting density of 30-150 g/l fluidized, however, this changes to less than 5 g/l, as a turbulent cloud. The specifically designed UWT electronics detect the switching point, despite the very low damping on the fork arm. This ensures, despite the difficult conditions, a reliable level limit signal.

- Sensitivity <math>< 5 \text{ g/l}</math>
- Also available with PFA coated cantilever



3. New for Vibrating Forks: Technical details VIBRANIVO® 1000/5000

Housing	Aluminium IP66 (Type 4)	
Pressure range	-1 up to +16bar (-14.5 up to +145psi)	
Electronic modules	Relay SPDT	19..230V AC, 19..55V DC
	Relay DPDT	19..230V AC, 19..36V/55V DC
	PNP	18..50V DC 3-wire
	2-wire without contact	10..230V AC/DC
	8/16mA or 4..20 mA	12,5-30/36V DC 2-wire
Certificates	ATEX II 1D and 1/2D ATEX II 1G and 1/2G EEx ia IIC ATEX II 2G EEx de [ia] II C, EEx d [ia] II C FM Cl. I, II, III, Div.1 Gr. A-G; Zone 0 CSA Cl. I, II, III Div.1 Gr. A-G; Zone 0 GOST-Ex, RTN Ex, IEC Ex, EHEDG	
Process Temperature range	-40°C up to +150°C (-40°F up to + 302°F)	
Sensitivity	from 5g/l (0.3lb/ft ³) adjustable in 2 steps	
Process connection	R1½ inch conical; NPT 1½ inch; flange DN100 PN6 and DN100 PN16; other flanges on request	
Vibration fork, extension	Stainless steel 1.4301 (SS304) or 1.4571 (SS316) various lengths	



Assembling options for series VIBRANIVO®

4. Application examples

Challenge

Our customer required full detection in a balance tank filled with silicic acid which is part of a conveyor system. It was critical to ensure quick reaction times and thus avoid the blocking of the filter. This application was further complicated by the extremely light material, in this case, a fluid-like silicic acid.

UWT solution

UWT's vibrating fork probe VIBRASIL[®] 90 meets these extreme requirements. It registers the level with virtually no time delay and is able to measure the very light interface of the silicic acid during the filling process. The VIBRASIL[®] 90 can be easily mounted from outside in a 1 ½" bush and can register bulk goods with a density of less than 5 g/l.



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4. Application examples

The international company AZO GmbH & Co. KG 2011 has successfully switched all their level control devices to those supplied by UWT with universal voltage.



The proven durability of the VIBRANIVO® 1000 which has been in operation since 1989.



Machinery and plant manufacturers benefit from the high-quality surface finish of the VIBRANIVO® 2000.



4. Application examples

Challenge

Our customer required to monitor the filling of the food tanker in the telescopic loading pipe. Potato starch is very dusty and cakes easily which make reliable measurement difficult.

Our solution

The UWT rotating paddle switch ROTONIVO[®] 3000 fulfils these extreme requirements. This is made possible through the ROTONIVO[®] 3000 's high quality allowing exact measurement customised to the density of the bulk goods and optimal sealing against dust. With these features the this series is predestined for such applications in potato starch.



5. Summary

- VIBRANIVO[®] 2000 surface finish of 0.75 micron prevents buildup, microbial deposits and facilitates cleanlines.
- The EHEDG certification for paddle switches and vibration forks enables them to be used in hygienic environments thus reducing maintenance and disinfection costs.
- Universal voltage electronics for rotating paddle switches allows these devices to be sold into all international markets.
- New electronics PNP for Rotonivo[®] 3000 and Rotonivo[®] 4000.
- Increased sensitivity of vibration forks allows the measurement of very lightweight materials with bulk density of less than 5 g/l.
- Vibrating forks for the detection of solids in water with the vibration probe VIBRANIVO[®] 1000.
- Vibrating probe VIBRANIVO[®] 1000 for use in harsh and rugged materials due to short forks (little surface).
- ATEX and IEC Ex certification according to the latest IEC 60079 series of standards.
- International approvals in Europe, Canada, North America, Russian Federation, Ukraine, Belarus and others.



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6. More information

See our contacts of the inner sales team at UWT GmbH who will be able to answer all your questions!

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