Radar Level Measurement in Bulk Solids
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When it comes to measuring the level of solid materials, the VEGAPULS 67 and VEGAPULS 68 radar represent the most advanced technology available. The sensors provide reliable level measurement during fill and empty cycles, solving the problem of lost measurement signals historically caused by dust.

**Advanced Design & Development**

The VEGAPULS 68 was specially developed for long-range measurement of bulk solids, and performs under extreme conditions and in the toughest applications. The instrument delivers reliable level data even under high temperatures, such as in steel production. Dusty conditions, such as those found in coal processing facilities or in building material storage silos, do not affect the VEGAPULS 68. The wide dynamic range of the sensor also opens up new possibilities for applications with powders and granulates in the food and chemical industries.

In order to provide the same performance in shorter range solids measurements that were previously dependent on ultrasonic technology, the VEGAPULS 67 was specifically developed. Unaffected by air turbulence and noise, the VEGAPULS 67 delivers reliable measurement values even during pneumatic filling. The VEGAPULS 67 has been proven to overcome difficult environmental conditions, offering superior measurement reliability at a low instrument cost.

With the development of the most complete line of radar sensors on the market, VEGA has set a new standard for continuous level measurement of bulk solids.

**Why Use Radar for Bulk Solids?**

VEGA radar technology has many benefits for bulk solids applications over alternative technologies such as ultrasonic, plumb bob, and yo-yo systems. In typical applications, VEGAPULS 67 and 68 set up in less than five minutes, and require no recalibration after initial configuration.

Unlike ultrasonics, pulse radar technology is unaffected by dust generation, buildup, and other environmental characteristics. This results in accurate continuous output and reliability during filling and emptying phases. With no moving parts, the VEGAPULS 67 and 68 are also an ideal measurement alternative to maintenance-intensive plumb bob and yo-yo systems.

Utilizing the VEGAPULS 67 and 68, a complete inventory management system is possible, offering infrastructure, automated alerts, local display, automated reorder, and the ability to better plan production.

**Certifications**

Pulse radar instrumentation is designed for certification compliance with the following programs:

- ATEX Standard
- CSA
- FM Standard
- GOST-R Standard
- SIL2
- IECEx
- WHG
- ABS
Benefits of VEGA Pulse Radar for Solids

Like all radar technology, the VEGAPULS 67 and 68 are non-contact, making them suitable for abrasive and corrosive products. Unaffected by air turbulence and noise, the VEGAPULS 67 and 68 deliver reliable measurement values even during pneumatic filling. Extreme dust generation has no effect on the sensors. They are the optimal solution for practically all areas of solids handling.

Optimized Signal Processing
Angles of repose in solids silos generate different echo signals than flat liquid surfaces. The evaluation algorithms of the VEGAPULS 67 have been adapted to these different reflection characteristics. Through the implementation of practice-oriented application parameters, only a few basic adjustments are necessary to adapt the sensor to a particular application.

Extreme Conditions
The VEGAPULS 68 is used in the most extreme solids level measuring conditions. The instrument delivers reliable level data, unaffected by adverse conditions such as high temperatures or dusty conditions. The wide dynamic range of the sensor opens up new possibilities for applications with powders and granulates in various industries.

High Sensitivity with Improved Technology
The sensor of the VEGAPULS 68 processes signals up to a thousand times smaller than those normally handled by conventional radar instruments. This high sensitivity enables measuring ranges up to 246 feet (75 meters), even for materials with poor reflective characteristics.

Benefits of the VEGAPULS 67 & 68
• Easy Setup: Typical system setup is less than 5 minutes, and no recalibration is necessary after initial configuration
• Low Cost of Ownership: Non-contact technology with no moving parts significantly reduces maintenance time and costs
• Ease of Measurement: The instruments are unaffected by dust generation, buildup, and other environmental characteristics, which results in accurate continuous output and reliability during filling and emptying phases
• Accuracy: Up to 2 mm accuracy, repeatable to 1 mm, with no zero point drift or fluctuations due to specific gravity, temperature, or pressure
• Complete Inventory Management: Self-contained measurement system offers infrastructure, automated alerts, local display, automated reorder, and the ability to better plan production
Principle of Operation

Radar technology is non-contact, making it ideal for many continuous level measurement applications. The VEGAPULS quickly evaluates signals and dynamically suppresses false echoes to ensure the accuracy of its level reporting. A large measurement memory and the ability to account for signal attenuation due to buildup supports the reliability of the technology.

Pulse
The sensor transmits energy in the form of microwave pulses. These pulses are directed toward the process surface, which reflects the energy back to the antenna.

Target
The amount of energy that returns to the antenna depends on the reflective properties of the material being measured. Reflectivity is determined by two characteristics: conductivity and dielectric constant (DK).

Return Time to Antenna
The transit time of the microwave pulse that returns to the antenna is measured and used to calculate the distance to the target.

Effect of Frequency
K-band systems utilize small antenna systems. The ability to mount in smaller process connections reduces installation costs. Brackets and other mounting fixtures can be designed to carry a smaller load because the VEGAPULS can be quite small at these frequencies. Special High Sensitivity electronics are used to distinguish the relatively weak signals that are reflected off the surface of powders and other fine materials in the tallest and narrowest of silos. The short K-band wavelength allows for fine signal resolution and the most accuracy offered by VEGA.
Technology Overview

VEGA utilizes three types of antennas for bulk solids measurements. Each has its own benefits for use in certain types of installations. Extensions, air purges, and dust covers are available, depending on the antenna type.

Plastic Encapsulated Antenna
The impedance cone distributes the microwaves evenly in the interior of the antenna. The metallized inner surface directs the microwave signals to the product.
- Measures up to 50 ft
- Lightweight
- All plastic exposed parts

Horn Antenna
A PTFE cone at the antenna junction projects the microwaves toward the horn antenna, and then focuses the microwaves in the direction of the product surface.
- Measures up to 230 ft
- Rugged construction
- Small diameters
- Can be extended up to 20 ft

Parabolic Antenna
The protected feed system is the focal point of the parabolic reflector. The antenna surface focuses the radiated microwave signal.
- Measures up to 246 ft
- For tall, narrow silos
- Best focusing
### VEGAPULS 67

**Pulse radar sensor for level measurement of bulk solids**
- SIL2 qualified; standard version
- Output signals include 4 … 20 mA/HART, Profibus PA, or Foundation Fieldbus
- Process connections include plastic flange or mounting loop

<table>
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<tr>
<th>Measuring Range:</th>
<th>0 … 50 ft (0 … 15 m)</th>
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<tr>
<td>Process Temperature:</td>
<td>-40 ... +176°F (-40 ... +80°C)</td>
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<tr>
<td>Antenna Type(s):</td>
<td>PVDF encapsulated</td>
</tr>
<tr>
<td>Measuring Precision:</td>
<td>± 2 mm</td>
</tr>
</tbody>
</table>

### VEGAPULS 68

**Pulse radar sensor for long-range level measurement of bulk solids**
- SIL2 qualified; standard version
- Output signals include 4 … 20 mA/HART, Profibus PA, or Foundation Fieldbus
- Process connections include ANSI flange, swivel flange, or NPT

<table>
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<tr>
<th>Measuring Range:</th>
<th>0 … 246 ft (0 … 75 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Temperature:</td>
<td>-40 ... +842°F (-40 ... +450°C)</td>
</tr>
<tr>
<td>Antenna Type(s):</td>
<td>Horn, parabolic</td>
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<tr>
<td>Measuring Precision:</td>
<td>± 2 mm</td>
</tr>
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</table>
# Pulse Radar for Solids in the plics System

## Indicating & Adjustment Module
- PLICSCOM
- VEGACONNECT

## Electronics
- 4 ... 20 mA/HART
- Profibus PA
- Foundation Fieldbus

## Housings
- Plastic
- Stainless Steel
- Aluminum
- Plastic Dual Chamber
- Stainless Steel Dual Chamber
- Aluminum Dual Chamber

## Process Fittings
- Thread
- Flange
- Custom Design

## Sensors
- Horn Antenna
- Encapsulated PVDF Antenna
- Parabolic Antenna
Trend-setting measurement technology evolves to meet the needs of people who use it. That is why we developed plics® — the world’s first modular product system for instrumentation. The modularity allows for easy component selection to meet individual application requirements. Because every one of our sensors is custom built from plics, the system fulfills the requirements of any industry and its specific applications.

Simpler Planning with plics
The choice and combination of sensors, process fittings, electronics, and housings simplifies instrument selection and engineering. With plics, cost reduction starts right at the planning stage.

Clear Advantages in Plant Construction
Short delivery times, simple wiring, and fast setup and commissioning save the plant builder significant time and costs. The configuration, wiring, and setup of VEGA instruments are always the same, so a single experience with the process is repeated with any plics measuring principle and application at any time.

Assistance for the User
plics gives a convincing performance in daily use because of its high operational reliability, simplified servicing, and reduced spare part stocking through the use of many identical components. The consistency of technology and operation simplifies and accelerates work with different plics instruments.

plics Advantages for Pulse Radar
As a plics device, a VEGA pulse radar sensor utilizes all the advantages of the modular system:

- Plastic, aluminum, and stainless steel housing options for any application
- Wide variety of process fittings and materials
- Standardized electrical connection concept
- Fast setup and commissioning via application-specific, menu driven software
- Two-wire/loop-powered operation
- Flexible mounting options include NPT, ANSI flange, and sanitary connections
- Hazardous area approvals available
- Diagnostic and asset management features
VEGAPULS 67 Application Areas

The VEGAPULS 67 radar provides accurate, reliable level measurement in bulk solids applications that were previously reliant on ultrasonic technology. Unlike ultrasonic, the VEGAPULS 67 is unaffected by dust and noise associated with filling and emptying cycles, making it a superior measuring technology to its alternatives.

Building Materials
Abrasive materials in rock quarries and roofing shingle plants can damage traditional contacting sensor technologies. Additionally, dusty conditions cause trouble with ultrasonic measurement sensors. The VEGAPULS 67 is unaffected by abrasive media and operates flawlessly in dusty conditions during the fill cycle.

- Non-contact sensor does not experience abrasive wear
- Radar technology is unaffected by noise generation
- Sensor easily retrofits, even with full silo

Coal, Coke, Aggregates
Fossil power customers and integrated steel mills are challenged with measurements of their raw materials. These materials are often very dusty and can adhere to contacting sensors. The VEGAPULS 67 accurately measures in very dusty conditions while being able to handle buildup on the face of the sensor.

- Radar technology is unaffected by dust generation
- Non-contact technology receives no mechanical loads on the sensor
- Dust Ex approval
“The VEGAPULS 67 and VEGAPULS 68 offer standard and long-range measurement of bulk solids, while utilizing advanced technology and superior measurement reliability.”

**Foodstuffs**

Raw material measurements in the food industry are challenging due to product consistency and dusty pneumatic filling. The VEGAPULS 67 accurately measures during all process conditions, including such difficult filling cycles. The VEGAPULS 67 excels in dusty conditions where traditional ultrasonic sensors struggle.

- Sensor materials meet strict hygienic requirements
- Radar experiences no signal loss during pneumatic filling
- Non-contact measurement is not influenced by product changes

**Fertilizers, Chemicals, Salt**

Corrosive materials in both fertilizer and chemical plants can destroy traditional contacting level sensors. The VEGAPULS 67 provides a non-contact level measurement with all plastic wetted parts for chemical compatibility.

- Sensor is highly chemically resistant
- Easy installation provides excellent retrofit options
- Non-contact measurement is not influenced by product changes
The VEGAPULS 68 is a powerful radar, specially developed for long-range measurement of bulk solids. It features highly sensitive electronics that enable it to filter out false signals from process conditions such as dust, noise, and buildup. The high dynamic range of the VEGAPULS 68 allows it to measure nearly any type of bulk solid, from large, coarse material to fine powders and granulates. With no moving parts, the VEGAPULS 68 is an ideal alternative to mechanical plumb bob and yo-yo systems.

Cement Clinker
Due to the highly abrasive properties of the clinker and temperatures up to 392°F (200°C), measuring techniques that physically contact the medium are ineffective. The VEGAPULS 68 non-contact radar sensor is absolutely wear-free and features very simple mounting and setup.

- Non-contact measurement experiences no mechanical loads on the sensor
- Powerful radar signal is unaffected by filling noise
- Air purge makes antenna cleaning possible

Steel, Molten Metals
Thanks to its robust construction, the VEGAPULS 68 easily withstands the tough requirements of the blast furnace environment. In addition, the sensor can be separated from the process anytime during operation when mounted on a suitable slide valve.

- Radar signal is unaffected by changing gas composition and temperature
- Small sensor dimensions and easy retrofitting provide mounting flexibility
“The sensor’s high frequency range allows for precise measurement while using small antennas and compact process fittings.”

**Plastic Powder, Pellets**

Plastic pellet measurements in the chemical industry are challenging based on changing bulk densities and low dielectric constants. The VEGAPULS 68 is not affected by changing bulk densities and is the most sensitive radar sensor on the market.

- Radar technology is unaffected by dust generation
- Non-contact measurement is not influenced by product changes
- Small antenna options are ideal in tall, narrow silos

**Grain Handling**

Long-range silo measurements in grain handling facilities have proven to be challenging for traditional level sensors. The VEGAPULS 68 has proven reliable in the longest range applications with narrow silos and dusty process conditions. The parabolic antenna can ensure measurement accuracy in narrow silos and small spaces between silos.

- Robust electronics experience no signal loss during pneumatic filling
- False echo filtering removes filling noise and other false signals
- Non-mechanical parts eliminate maintenance and servicing needs seen with plumb bob and yo-yo systems
Setup and Adjustment

“With VEGA technology, any user can set up a measuring point exactly as the system requires. Remote parameter adjustment with a control system is just as easy and flexible as setup at the sensor.”
PLICSCOM – Multi-Function Ability

The PLICSCOM indicating and adjustment module plugs into any plics® instrument on-demand. It functions as a measured value indicator on the instrument and as a local adjustment device. The structure of the adjustment menu is clearly organized and makes setup and commissioning easy. In addition, the status messages are displayed directly on the screen. When an instrument is exchanged, PLICSCOM ensures fast availability of the measuring point — all sensor data is saved by pressing a key on the PLICSCOM and later copied into the replacement sensor.

External Indicating and Adjustment

An external indicating and adjustment unit with integrated PLICSCOM can be connected to the sensor with a standard cable up to 50 meters long. It allows setup of the measuring point, even in difficult to access locations, and requires no external power.

PC Adjustment with VEGACONNECT

For increased setup versatility, the mobile VEGACONNECT easily connects VEGA instruments to any PC through the USB interface. The parameter adjustment of these instruments is accomplished by PACTware adjustment software and a DTM. VEGACONNECT also acts as a universal HART modem for sensors of other manufacturers.

Setup with a HART Handheld

A HART Handheld is an additional tool that enables on-site sensor parameter adjustment. To access the HART parameters of a sensor, it connects to the sensor cable through a minimum working resistance of 220 ohms.