Technologies, Solutions, and Applications

Radar Level Measurement in Bulk Solids
### Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership in Solids Level Measurement</td>
<td>3</td>
</tr>
<tr>
<td>How We Earn Your Business</td>
<td>4</td>
</tr>
<tr>
<td>Models &amp; Versions</td>
<td>5</td>
</tr>
<tr>
<td>Technology Overview</td>
<td>6</td>
</tr>
<tr>
<td>About Continuous Through-Air Radar</td>
<td>7</td>
</tr>
<tr>
<td>Pulse Radar for Solids in the plics System</td>
<td>8</td>
</tr>
<tr>
<td>Additional Switching Technologies for Bulk Solids</td>
<td>9</td>
</tr>
<tr>
<td>Application Areas</td>
<td>10</td>
</tr>
<tr>
<td>Setup &amp; Adjustment, Communication &amp; Visualization</td>
<td>14</td>
</tr>
</tbody>
</table>
When it comes to measuring the level of solid materials, VEGA’s through-air radar and microwave barrier switches 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.

Benefits of Using Radar for Solids

- **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

- **Complete inventory management with non-contact level measurement:** Self-contained measurement system offers infrastructure, automated alerts, local display, automated reorder, and the ability to better plan production
How We Earn Your Business

You are the center of our commitment to value and service. We hold our customers in the highest regard. Every action and interaction undertaken by a VEGA employee is to ensure that the customer gets the most out of their experience. Service is our top priority.

Lead Times Start at 5 Days
Nearly 80% of VEGA’s standard products are available with 5-day lead times or less under the SPEED program! These lead times are symbolic of VEGA’s commitment to solving the ever-changing needs of the market through continuous improvement.

Performance Guarantee
To demonstrate our commitment to specifying the right instrument for each application, VEGA Americas offers a Performance Guarantee — if our recommended solution does not perform exactly as expected, we’ll make it right.

24 Hour Support
The VEGA Field Service team is trained to provide telephone, email, or on-site customer service. Whether starting up, configuring, or troubleshooting the system, VEGA Field Service provides necessary steps to ensure the measuring device and its outputs run efficiently. Through service and training, VEGA supports all users throughout the life of the installed solutions.

The Right Instrument for Every Application
VEGA is committed to supplying instruments that work in all applications, not just those with ideal conditions. All new instruments are tested in extreme heat, dust, chemical, moisture, and cold environments before they are released. VEGA’s goal is to enable customers to achieve operational efficiency with every measured process.
## Models & Versions

### 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>
<thead>
<tr>
<th>Measuring Range:</th>
<th>0 ... 50 ft (0 ... 15 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Temperature:</td>
<td>-40 ... +176°F (-40 ... +80°C)</td>
</tr>
<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>
<thead>
<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>
</tr>
<tr>
<td>Measuring Precision:</td>
<td>± 2 mm</td>
</tr>
</tbody>
</table>
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
**About Continuous Through-Air Radar**

**Why Use Radar for Bulk Solids?**

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

Unlike ultrasonic, 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 is an ideal level measurement alternative to maintenance-intensive plumb bob and yo-yo systems.

**The Through-Air Radar Principle of Operation**

**Pulse**

The VEGAPULS emits a microwave pulse that travels down to the process surface.

**Return Time**

The microwave pulses are reflected by the material. The transit time of the microwave pulse returning to the electronics is measured and used to calculate the distance to the medium.
Pulse Radar in the plics System

**Indicating & Adjustment Module**

- PLICSCOM
- VEGACONNECT
- DTM

**Electronics**

- 4 ... 20 mA
- HART
- Profibus PA
- Foundation Fieldbus
- Modbus

**Housings**

- Plastic
- Stainless Steel
- Aluminum

- Plastic Dual Chamber
- Stainless Steel Dual Chamber
- Aluminum Dual Chamber

**Process Fittings**

- Thread
- Flange
- Sanitary
- Custom Design

**Antennae**

- Horn Antenna
- Encapsulated PdDF Antenna
- Panoramic Antenna

**plics® Advantages**

As the world’s first modular measurement system, plics provides these benefits to VEGA customers:

- Local display and adjustment module with the PLICSCOM
- PC connection through the VEGACONNECT
- Ability to easily change the electronics of a device in the field
- Echo curve recording through plics electronics
- Modular system allows quick manufacturing and speedy product delivery
- Cost-effective instrumentation with customized instrument configurations
- Ability to exchange sensors if damaged in the field

**Explosion protection**

**Safety standards**

**Certifications**

Through-air radar instrumentation is designed for certification compliance with the following programs:

- ATEX Standard
- CSA
- FM Standard
- GOST-R Standard
- SIL2
- INMETRO
- IECEx
- WHG
- FDA
- ABS
- 3A
Additional Switching Technologies for Bulk Solids

**VEGAVIB**

Vibrating level switch for detection of solids
- SIL2 qualified; standard version
- Output signals include Contactless, Relay, Transistor, Two-Wire, NAMUR
- Process connections include 1" NPT, ANSI flange

**VEGAWAVE**

Vibrating level switch for detection of solids
- SIL2 qualified
- Output signals include Contactless, Relay, Transistor, Two-Wire, NAMUR
- Process connections include 1½" NPT, ANSI flange

**VEGACAP**

Capacitive level switch for detection of solids
- Output signals include Contactless, Relay, Transistor, Two-Wire
- Process connections include ¾" NPT, ANSI flange

**VEGAMIP**

Microwave barrier switch for level detections of bulk solids
- Relay output signal
- Process connections include 1½” NPT, ANSI flange
The VEGAPULS 67 radar provides accurate, reliable level measurement in bulk solids applications that were previously reliant on ultrasonic technology. Unlike ultrasonics, 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.

- 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
Application Areas

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 suitable ball 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
Local Setup and Adjustment
The PLICSCOM indicating and adjustment module plugs into any plics instrument. 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, 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.

Current Standards for Data Transmission
VEGA offers proven, reliable solutions, including 4 … 20 mA/HART measurement data transmission, fieldbus technologies like Profieldus PA, Foundation Fieldbus, or Modbus — RTU, ASCII, and Levelmaster protocols, and wireless transmission. For level detection, the selection includes contactless switch, relay, transistor, mA step change, and NAMUR signal.

Setup and Adjustment through a PC, Control System, or Handheld Device
FDT/DTM technology is an innovative, manufacturer-independent description technology for field instruments. Complex field instruments operate with PCs using PACTware® as easily as with the current engineering and operating environments of control systems. With DTMs, the sensors are easily configurable and important adjustments can be carried out quickly.

VEGA supports all main standards for uniform, centralized field instrument operation. If the instruments are integrated in primary management or control systems, the field instruments are accessible for adjustment, servicing, and diagnostic purposes through the existing infrastructure. Both DTM and EDD description technologies are supported.
Network Connectivity
Measured values are retrievable locally or by Ethernet network and displayed by a web browser.

Central Visualization
Visualization systems provide inventory management and alarming for VEGA level measurement devices.

VEGAMET/VEGASCAN
Signal conditioning instrument for continuous measurement
- HART sensor input with transmitter power supply for all connected devices
- Relay outputs, scalable current outputs with the VEGAMET
- PACTware software for adjustment functions such as scaling and linearization
- Measured value and message transmission via e-mail or integrated web server
- Suitable for Inventory Management or Vendor Managed Inventory with remote enquiry

VCCS
Central visualization cabinet for level measurement
- Connect up to 30 two-wire HART VEGA devices
- Multiple user-defined alarms — Low, Low-Low, Hi, Hi-Hi
- Provides real time material inventory to DCS, PLC, SCADA, or Internet
- On-board industrial Ethernet switch allows for direct connection to existing LAN