

## Solid Level Detection Sensors and Measurements

Knowing the amount of bulk solids inside a silo, tank, or other vessel is an important variable in any process to maximize efficiency, prevent overflows, running out, or for tracking volume or mass. A common way to monitor these variables is by measuring the level. This can be something as simple as a full or empty signal, or it can be a continuous level measurement to track and control the level changes during a process.

To measure level in a bulk solids container, there are a number of different technologies used ranging from the simple to very complex. VEGA uses sensors, transmitters, and switches with five main technologies to measure level in a multitude of different applications across at least a dozen key industries.

### Solid Level Measurement Technologies

The technologies at VEGA are: radar, guided wave radar, vibration, capacitance, and radiometric. These different measuring methods detect level and convert that level into an electronic signal to be displayed directly on site or incorporated into a process control or management system. Each of these technologies has their pros, cons, and different price points. It comes down to what type of solid is being measured, what is happening inside the vessel, the vessel's construction, the best technology for the application, and the customer's preference.

## Radar

### How it works

Radar sensors send microwave signals toward the bulk solids being measured from above. The surface of the bulk solids below reflects the signals back in the direction of the antenna system. The instrument uses the time of flight for the microwave signals to determine a distance to the product surface, and then calculates a level inside using the known height of the tank, silo, or vessel.

### VEGA Radar Sensors

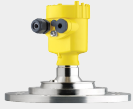
VEGA's radar sensors operate under three different frequencies: C-Band (5-8 GHz), K-Band (18-27 GHz), and W-Band (75-110 GHz). All three are used for continuous non-contact level measurement for all kinds of bulk solids. They can be used for bulk solids ranging in size from fine powders to large chunks, and are suitable for applications with stringent hygiene requirements.

### Advantages

- Non-contact bulk solid measurement with high accuracy
- Measurement not affected by temperature, pressure, dust, or noise
- User-friendly adjustment saves time
- Accurate measurement without any moving parts
- Maintenance-free operation through non-contact measuring principle

Discover the right radar for your application

**Related products**



VEGAPULS 69



VEGAPULS 67



VEGAPULS 68

## Related applications

- Crusher
- Raw meal silo
- Conveyor belt

## Guided Wave Radar

### How it works

Guided wave radar sensors use time domain reflectometry to measure level. A cable or rod probe is mounted on top of the tank, silo, or vessel, and a low amplitude, high-frequency microwave pulse is sent down the probe to be reflected by the surface of the bulk solid. Once the pulse reaches the surface, a portion of the signal bounces back, and the amount of time it takes for the pulse to be transmitted and returned determines the level inside the tank, silo, or vessel.

### VEGA Guided Wave Radar

The VEGAFLEX 82 can measure light and heavy-weight bulk solids even in the presence of dust and buildup. Two different probe options – cable or rod – ensure an accurate measurement for any range of bulk solids being measured.

### Advantages

- Comprehensive diagnostic options ensure low-maintenance operation
- Shortenable probes enable simple standardization and maximum flexibility
- Measurements not affected by dust, noise, or varying dielectric constant

Discover the right guided wave radar for your application

## Related products



VEGAFLEX 82

## Related applications

- [Lime silo](#)
- [Medium-sized silos for bulk solids](#)

## Vibration and Capacitance: Liquid Level Switching

### How it works

Solid level switches detect when a certain predefined level is reached by the bulk solids inside a silo, tank, or vessel. These sensors are used when it's not necessary to know where level is at every moment, like with continuous level measurement. A switch output can start or stop conveyors, sound an alarm, or simply turn on a light. Point level switches outputting a binary signal can be integrated into a process control system.

### VEGA Switches

VEGA uses four different technologies for solid level switching: vibration, capacitance, microwave barrier, and radiometric.

Vibration switches, the VEGAVIB and VEGAWAVE series, are contact instruments that monitor vibration amplitude. These switches constantly vibrate at a specific amplitude. The amplitude changes once the solid reaches the vibration switch, and this change activates the output.

Capacitance switches, the VEGACAP series, are also contact instruments, but these measure capacitance in a system composed of the sensor, vessel, and the product inside. Once the solid reaches the sensor probe, there is a change in capacitance, and the switch output changes state.

Microwave barrier switches use two parts: a transmitter and a receiver. In between is an "invisible" barrier, and the switch is activated once that microwave barrier is broken or interrupted. These switches, called the VEGAMIP at VEGA, can provide "full" or "empty" options, and they can ignore product falling into a vessel.

Lastly, radiometric switches operate similarly in principle to microwave barrier switches, but these instruments use gamma radiation emitted from a source holder while a detector measures the amount of radiation reaching it. Unlike any of the previously mentioned switches, radiometric switches can be installed completely externally, which is why they're typically used to measure harsh or volatile processes like those seen in the paper industry, mining, and building materials.

### Advantages

- Minimum or maximum detection with low maintenance costs
- Vibration switches are simple plug and play instruments
- Microwave barrier switches offer simple adjustment
- Radiometric switching is completely non-contact

Discover the right solid level switch for your application

**Related products**



VEGA VIB 61



VEGA WAVE 61



VEGA MIP T61



VEGA MIP R61



## Related applications

- [Large storage silos](#)
- [Buffer tank](#)
- [Bulk solids stockpile](#)

## Radiometric

### How it works

Radiometric level measurement sounds complicated, but the principle behind it is relatively easy to understand. Gamma radiation emits from a source holder, and a detector measures the radiation that reaches it. The amount of energy reaching the detector will vary based on the amount of solids inside the tank, silo, or vessel. The electronics inside the detector use the gamma reading to infer a measurement and output the value.

### VEGA Radiometric Sensors

The ProTrac Series is used for continuous level and point level monitoring in the most difficult bulk solids applications because they measure without contacting the process material. This means there is no chance of damaging the detectors with harsh, abrasive, or corrosive products that would require frequent and expensive maintenance. Plus, these instruments are impervious to thermal shock, drastic pressure shifts, and other extreme process conditions.

### Advantages

- Maximum operational reliability even in the harshest environments
- Measurement is independent of pressure, temperature, and product aggressiveness
- Measuring system can be installed on the outside of a vessel during ongoing production
- Retrofitting is made easy through a family of adapter brackets

Discover the right radiometric instrument for your application

**Related products**



POINTRAC 31



FIBERTRAC 31



SOLITRAC 31

## Related applications

- Cyclone
- Digester
- Continuous catalyst regeneration