Technologies, Solutions, and Applications

Guided Wave Radar for Level
Leadership in Guided Wave Radar

VEGA is proud to be a leading provider of microwave radar measurement technology. When it comes to measuring the level of process and storage materials, the VEGAFLEX 60 series of guided wave radar devices represents the most advanced technology available. The VEGAFLEX overcomes difficult environmental conditions, offering superior measurement reliability at a low instrument cost.

Advanced Design & Development
Guided wave radar instrumentation is a proven technology for level measurement, with perhaps the widest spectrum of applications possible. The diversity of options found in the VEGAFLEX guided wave radar product line is a testament to the fact that VEGA places chief importance on product development that solves problem applications. Whether the application has changing product features, is prone to foaming, or takes place in a bypass tube, a VEGAFLEX guided wave radar can be built with the ideal component features to reliably and accurately make the measurement.

Certifications
Guided wave radar instrumentation is designed for certification compliance with the following programs:

- ATEX Standard
- CSA
- FM Standard
- GOST-R Standard
- SIL2
- IECEx
- WHG
- FDA
- ABS

Why Use Guided Wave Radar?
Guided wave radar has many benefits over traditional level measurement technologies. With no moving parts and easy to configure electronics, the VEGAFLEX eliminates many of the measurement and maintenance issues associated with DP cells and mechanical float systems.

Guided wave radar does not experience errors caused by temperature, pressure, or specific gravity shifts, making the technology less susceptible to the measurement errors often associated with capacitance probes and ultrasonic transmitters. In solids applications, the VEGAFLEX is able to reliably measure during the fill and empty cycles, overcoming the common errors seen with ultrasonic sensors.

The VEGAFLEX guided wave radar operates by the use of electromagnetic microwave pulses and provides accuracy within 3 mm. In addition, the sensors will never need to be recalibrated after initial configuration, and will not experience zero point drift or fluctuations due to specific gravity, temperature, dust, or pressure. This translates into less time spent on setup, maintenance, and troubleshooting, resulting in a worry-free installation that will perform beyond expectation.
Principle of Operation

Guided wave technology is ideal for applications with a variety of process conditions. The VEGAFLEX has no moving parts and is factory-programmed for its operating span. Guided wave radar is unaffected by shifts in pressure, temperature, or product specific gravity, making it reliable for level measurement.

Pulse
The VEGAFLEX emits a microwave pulse at a frequency of 2GHz. This pulse travels down to the product surface "guided" by a metallic cable or rod.

Types of Probes
VEGAFLEX instruments are available with 3 types of probes: a single rod, a cable, or a coaxial tube. The single rod is for liquids or solids. The cable probe is for liquids or solids. The cable version allows for easy measurement in long range applications or measurements in heavier solids. The coaxial probe consists of a single rod contained inside an outer tube. This system is very efficient and is for use with liquids only.

Target
The microwave pulses are reflected from a solid or liquid material. The return pulse is "guided" back up the probe to the electronics.

Return Time
The transit time of the microwave pulse returning to the electronics is measured and used to calculate the distance to the target.
Models & Versions

VEGAFLEX 61

Guided wave radar sensor for liquids or light solids
- SIL2 qualified; standard version
- Output signals include 4 ... 20 mA/HART, Profibus PA, or Foundation Fieldbus
- Process connections from ¾" NPT, ANSI flange

<table>
<thead>
<tr>
<th>Probe:</th>
<th>Cable, rod</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring Range:</td>
<td>Cable: 0 ... 104 ft (0 ... 32 m)</td>
</tr>
<tr>
<td></td>
<td>Rod: 0 ... 13 ft (0 ... 4 m)</td>
</tr>
<tr>
<td>Process Temperature:</td>
<td>-40 ... +302°F (-40 ... +150°C)</td>
</tr>
<tr>
<td>Process Pressure:</td>
<td>-14 ... +580 psi (-1 ... +40 bar)</td>
</tr>
<tr>
<td>Measurement Medium:</td>
<td>Liquids, light solids</td>
</tr>
</tbody>
</table>

VEGAFLEX 62

Guided wave radar sensor for liquids or solids
- SIL2 qualified; standard version
- Output signals include 4 ... 20 mA/HART, Profibus PA, or Foundation Fieldbus
- Process connections from 1½" NPT, ANSI flange

<table>
<thead>
<tr>
<th>Probe:</th>
<th>Cable, rod</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring Range:</td>
<td>Cable: 0 ... 197 ft (0 ... 60 m)</td>
</tr>
<tr>
<td></td>
<td>Rod: 0 ... 20 ft (0 ... 6 m)</td>
</tr>
<tr>
<td>Process Temperature:</td>
<td>-40 ... +302°F (-40 ... +450°C)</td>
</tr>
<tr>
<td>Process Pressure:</td>
<td>-14 ... +580 psi (-1 ... +40 bar)</td>
</tr>
<tr>
<td>Measurement Medium:</td>
<td>Liquids, heavy solids</td>
</tr>
</tbody>
</table>
## VEGAFLEX 63

Guided wave radar sensor for sanitary or highly corrosive environments
- SIL2 qualified; standard version
- Output signals include 4 ... 20 mA/HART, Profibus PA, or Foundation Fieldbus
- Process connections include tri-clamp or ANSI flange

<table>
<thead>
<tr>
<th>Probe</th>
<th>Cable, rod</th>
</tr>
</thead>
</table>
| Measuring Range: | Cable: 0 ... 104 ft (0 ... 32 m)  
Rod: 0 ... 13 ft (0 ... 4 m) |
| Process Temperature: | -40 ... +302°F (-40 ... +150°C) |
| Process Pressure: | -7 ... +232 psi (-0.5 ... +16 bar) |
| Measurement Medium: | Sanitary, corrosive liquids or solids |

## VEGAFLEX 65

Guided wave radar sensor for specialized liquid measurement
- SIL2 qualified; standard version
- Output signals include 4 ... 20 mA/HART, Profibus PA, or Foundation Fieldbus
- Process connections from ¾" NPT, ANSI flange

<table>
<thead>
<tr>
<th>Probe</th>
<th>Coaxial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring Range:</td>
<td>0 ... 20 ft (0 ... 6 m)</td>
</tr>
<tr>
<td>Process Temperature:</td>
<td>-40 ... +302°F (-40 ... +150°C)</td>
</tr>
<tr>
<td>Process Pressure:</td>
<td>-14 ... +580 psi (-1 ... +40 bar)</td>
</tr>
<tr>
<td>Measurement Medium:</td>
<td>Liquids</td>
</tr>
</tbody>
</table>
### VEGAFLEX 66

**Guided wave radar sensor for high temperature and pressure environments**

- SIL2 qualified; standard version
- Output signals include 4 ... 20 mA/HART, Profibus PA, or Foundation Fieldbus
- Process connections from \( \frac{3}{4} \)" NPT, ANSI flange

<table>
<thead>
<tr>
<th>Probe:</th>
<th>Cable, rod, coaxial</th>
</tr>
</thead>
</table>
| Measuring Range: | Cable: 0 ... 104 ft (0 ... 32 m)  
Rod: 0 ... 20 ft (0 ... 6 m)  
Coaxial: 0 ... 20 ft (0 ... 6 m) |
| Process Temperature: | -328 ... +752°F (-200 ... +400°C) |
| Process Pressure: | -14 ... +5,800 psi (-1 ... +400 bar) |
| Measurement Medium: | High temperature and high pressure liquids or solids |

### VEGAFLEX 67 (Interface)

**Guided wave radar sensor for liquid interface measurement**

- SIL2 qualified; standard version
- Output signals include 4 ... 20 mA/HART, Profibus PA, or Foundation Fieldbus
- Process connections from \( \frac{3}{4} \)" NPT, ANSI flange

<table>
<thead>
<tr>
<th>Probe:</th>
<th>Cable, rod, coaxial</th>
</tr>
</thead>
</table>
| Measuring Range: | Cable: 0 ... 104 ft (0 ... 32 m)  
Rod: 0 ... 20 ft (0 ... 6 m)  
Coaxial: 0 ... 20 ft (0 ... 6 m) |
| Process Temperature: | -328 ... +752°F (-200 ... +400°C) |
| Process Pressure: | -14 ... +5,800 psi (-1 ... +400 bar) |
| Measurement Medium: | Interface liquids |
Guided Wave Radar in the plics System

Indicating & Adjustment Module

Electronics

Housings

Process Fittings

Sensors

PLICSCOM  VEGACONNECT

4 ... 20 mA/ HART  Profibus PA  Foundation Fieldbus

Plastic  Stainless Steel  Aluminium

Plastic Dual Chamber  Stainless Steel Dual Chamber  Aluminium Dual Chamber

Thread  Flange  Sanitary

Cable  Rod  Coaxial
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 Guided Wave Radar

As a plics sensor, VEGAFLEX utilizes all the advantages of the modular system:

- Housings of plastic, aluminium, or stainless steel for any application
- Wide variety of process fittings and materials
- Not influenced by angle of repose in solids application
- Standardized electrical connection concept
- Factory presets to the length of the probe for fast setup and commissioning
- Exchangeable rod and cable design
- 4...20 mA/HART, Foundation Fieldbus, or Profibus PA outputs
Application Areas

The VEGAFLEX is ideal for continuous level measurement in a wide variety of industries and applications. The instruments are unaffected by foam, dust, and vapor, making the guided wave principle multi-functional across liquids and solids measurements. With no moving parts, the VEGAFLEX is an ideal candidate for retrofitting mechanical technologies.

Storage of Aggregates & Cement
The VEGAFLEX 61 is an ideal solution for continuous measurement in aggregate and cement silos up to 33 ft (10 m) high. By virtue of the guided wave measuring principle, adjustment with product is not necessary. The instrument comes pre-adjusted by the factory, so on-site setup only involves an electrical connection. The measuring results are not influenced by product quality, dust generation, or by the shape of the material heap.

- Non-moving parts are wear- and maintenance-free
- SIL2 design ensures high operational reliability
- Guided wave principle is insensitive to dust and buildup allowing for reliable measurement during filling and emptying of vessels

Crude Oil
The VEGAFLEX 61 is ideal for measuring the level of crude oil at tank battery locations. The length of the 4 mm cable can easily be shortened, allowing the user to quickly adapt a single instrument to a variety of tank sizes. After shortening, the sensor only needs to be programmed with the new length in order to allow the output signal to correspond to the actual tank level. The VEGAFLEX 61 is immune to condensation and buildup, and is suitable for use in metal or plastic vessels.

- Cable probe is easily shortened or exchanged
- Guided wave principle is insensitive to vapor or buildup
- Guided wave technology is unaffected by product properties
“The guided wave principle of the VEGAFLEX is unaffected by the dust, vapor, buildup, and condensation present in many applications and provides highly accurate, repeatable continuous level.”

**Mud Production**

Bulk solids such as silica, aluminium oxide, barite, cement, and binding agents are often stored in tanks about 10 ft (3 m) height. The VEGAFLEX 62 is the ideal sensor for such small measuring ranges. The VEGAFLEX 62 is not affected by the physical properties of the medium, the process temperature, or the process pressure.

- Factory pre-adjustment expedites setup time
- Guided wave technology is unaffected by dust, vapor, buildup, and condensation

**Food and Dairy Production**

VEGAFLEX 63 offers the ideal solution for level measurement in food and dairy production. The guided wave device is immune to temperature shocks and pressure changes. It performs reliably under the changing and sometimes foaming applications common in the food and dairy industries.

- High accuracy is not affected by foam generation
- Coated rod and cable design with sanitary connections enables easy cleaning for hygienic applications
Application Areas

Natural Gas Condensate Measurement
At the well site and before the natural gas is sent to the plant for processing, water and other moisture is removed. A condensate tank at the well site holds the produced water until it can be disposed, and with a reliable level measurement it can be determined if there is a valuable layer of hydrocarbons floating on top of this water. The VEGAFLEX 67 measures the overall level of liquid in the tank, as well as how much liquid is water and how much of it is hydrocarbon.

- SIL2 design ensures high operational reliability
- Guided wave principle is unaffected by vapor and condensation

Liquefied Gas Measurement
The VEGAFLEX 65 is the ideal instrument for measuring the level of liquefied gases in horizontal bullet tanks. The coaxial probe focuses the microwave energy to the surface of the liquid, and channels the reflected energy. This is important because liquefied gases often reflect microwave energy poorly. The measurement takes place inside the perforated tube of the VEGAFLEX 65, so the measuring value is not affected by the mounting nozzle height or obstructions in the tank.

- Robust materials allow for measurement in temperatures as low as -328°F (-200°C)
- Coaxial probe is suitable for products with poor reflective properties
“Factory precalibration to the length of the probe allows for easy field installation and commissioning with an electrical connection.”

**Distillation Columns**

The VEGAFLEX 66 can be used for distillation columns in place of a less reliable displacer system in a chamber. Existing chambers can be used for the measurement, making mechanical modifications unnecessary. The VEGAFLEX 66 is an optimum solution for this measurement because of its operating temperature of up to 752°F (400°C) and its pressure capability of up to 5,800 psig (400 bar).

- Easy retrofit allows use of existing bypass tubes
- Guided wave principle is unaffected by existing process connections of the bridle

**Asphalt Mixing**

The continuous level sensor VEGAFLEX 66 is ideal for measurements in liquid asphalt. Neither buildup nor foam from the liquid asphalt influences the measurement. Internal vessel installations, such as heating elements, also do not affect the measurement.

- Cable probe measurement is unaffected by buildup, foam, and condensation
- Non-moving parts are wear- and maintenance-free
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 25 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.