

# RADAR IS THE BETTER ULTRASONIC



Compact level sensors with  
80 GHz radar technology

**VEGA** HOME  
OF VALUES

# ULTRASONIC WAS YESTERDAY – THE FUTURE IS 80 GHZ RADAR!

As the market leader, VEGA has been developing radar based level sensors for 30 years. These radar sensors are currently in use in more than 1,000,000 applications. Users all around the globe appreciate the many advantages of this technology:

- **Maximum reliability and accuracy**
- **Unaffected by temperature fluctuations**
- **Resistant to dirt and buildup**
- **Measurement under vacuum and high pressure**
- **Wear and maintenance free**

A new era in radar measurement technology began a few years ago when VEGAPULS sensors based on an operating frequency of 80 GHz were introduced. The 80 GHz technology allows a much more precise focusing of the transmission signal. This makes it easier to separate actual level signals from interfering signals – this means the measurement becomes easier to make and much more reliable. That's why VEGA radar sensors with 80 GHz are steadily taking over new applications all over the world.

VEGA has now added a new compact instrument series to this portfolio of radar sensors. These devices are also ideal for more economical applications such as those found in the water and wastewater industry or for auxiliary measuring points in process automation.

Level measurement with ultrasonic sensors, which are still in use today, is thus rapidly becoming a thing of the past. The future is radar!

## About VEGA

VEGA is a world-leading manufacturer of process instrumentation. Their product portfolio includes sensors for measurement of level and pressure as well as point level detection, with additional devices and software for integrating sensors into process control systems.

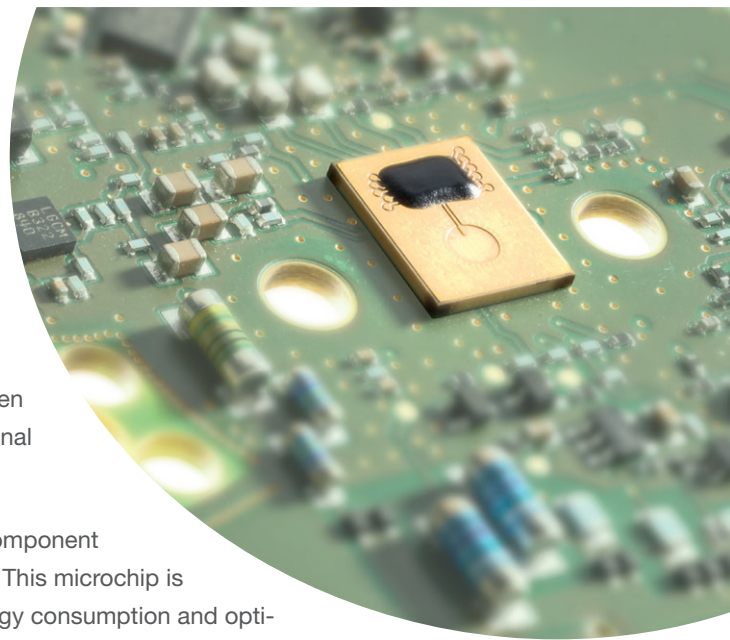
Founded in the Black Forest in 1959, VEGA today employs over 2,100 people worldwide, more than 1,000 of them at the headquarters in Schiltach in the Black Forest. Each and every one of them works with great passion to find the best solution for the customer's application – across all industries.



## A new heart for radar sensors

Today, radar sensors can be found in all areas of daily life, from simple motion detectors for door openers to complex distance sensors in vehicles. The technical requirements for industrial level measurement, however, are completely different. While people and vehicles reflect radar signals very well, process media are often difficult to detect. For this task, sensors require a much higher signal sensitivity.

That's why VEGA have developed their own radar microchip, a component specifically optimized for the requirements of level measurement. This microchip is at the heart of the new sensors. Thanks to its small size, low energy consumption and optimized frequency ranges, very compact radar instruments can now be built. These are considerably less expensive and can replace ultrasonic measurement technology in virtually all applications.



## Made for everyday use

80 GHz radar sensors feature excellent signal focusing capability. Unaffected by temperature fluctuations and virtually all other operational conditions, they impress users with their reliable measured values. The new compact instrument series is designed for standard measuring tasks and thus ideally complements the existing range of VEGAPULS 60 series plics® radar sensors.

### Compact version

- Small PVDF process fittings
- For liquids and bulk solids
- Optional display



VEGAPULS  
11, 21, 31



VEGAMET  
841/842,  
861/862



VEGAMET  
141/142



VEGAMET  
341/342

### Cable version

- Fixed cable connection (IP68)
- Reliable performance, even during flooding
- Direct output signals  
4 ... 20 mA, HART, SDI-12, Modbus



VEGAPULS  
C 11, C 21,  
C 22, C 23

### Controllers

in combination with up to two radar sensors

- Large graphical display
- Optimized for applications in water and wastewater
- Weatherproof housing

# THE ADVANTAGES OF RADAR TECHNOLOGY

Radar sensors measure much more reliably than ultrasonic sensors. During the development of the new compact instrument series, the focus was also on simple installation and operation. All application parameters can now be set very quickly. Via the VEGA Tools app, also wirelessly with a smartphone or tablet.

## Process and environmental influences



Due to their physical measuring principle, ultrasonic sensors are easily affected by ambient conditions: the transit time of sound, for example, is affected by variation of temperature (e.g. solar radiation), changing vapours or gasses affect the accuracy. Strong wind or rain, or even fog, can also damp the emitted sound waves and further restrict the measurement performance.

**Radar sensor performance is not affected by temperature, pressure or vacuum and remains able to deliver correct, reliable readings under all environmental conditions.**

## Dirt and condensate



In many applications, sensors struggle with buildup. This applies especially to ultrasonic sensors: buildup affects the reliability of the measurement signal and increases the dead zone. Optimized signal processing enables radar sensors to suppress interference caused by buildup on the antenna system.

**Radar sensors are immune to the effects of dirt and buildup and do not have to be cleaned.**

## Dead zone and submersion



Due to process conditions, sensors are regularly flooded in some applications. To counteract this, ultrasonic sensors are often equipped with anti-submersion shields. However, these shields can also easily collect dirt and flotsam, which ultimately degrades their measurement reliability. Radar sensors have no dead zone (blanking distance) so they don't need this protection, they function reliably, even when flooded.

**Radar sensors enable reliable measurement right up to the sensor antenna itself, even when flooded.**

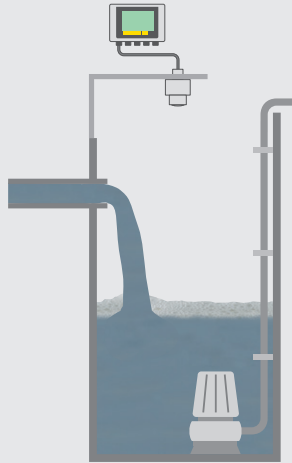
## Reliability and accuracy



Thanks to the strong focusing of 80 GHz technology, the radar beam can be aimed at the measured medium with pinpoint accuracy. As a result, even narrow shafts or deposits on vessel walls or internals such as pipes or pumps cannot generate interfering signals. In contrast to ultrasonic, no false signal suppression is necessary.

**Radar sensors are highly suited for use in confined spaces and vessels with internal installations.**

## Pumpstation



### No interfering signals due to cramped operating space

Pumping stations are used to compensate for unfavourable sewer gradients. Level measurement in the pump shaft enables cost-effective control of the pumps. Radar sensors deliver exact readings even with dirt, foam or condensate in the shaft, even spider webs don't bother the radar sensor. Thanks to its narrow focusing, the new radar sensor performs extremely well in confined spaces resulting from small shaft dimensions, buildup on the walls or protruding fixtures.

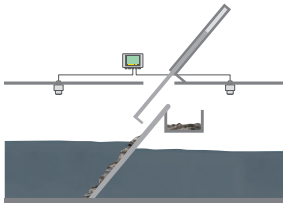
- Exact measuring results unaffected by shaft internals
- Long service life through use of highly resistant materials
- Controller with intelligent pump management for optimal operation and energy usage

## Rake control



### Unaffected by environmental conditions

Mechanical pre-cleaning removes floating matter with rakes or sieves. Measurement of the water level difference between the front and the back of the screen is used to determine the degree of contamination and control the cleaning of the screen. Radar sensors provide reliable measurement data even when exposed to the elements, e.g. intense solar radiation. Even small wastewater treatment facilities are no problem for the radar sensor, as there is no dead zone restricting its measuring range.



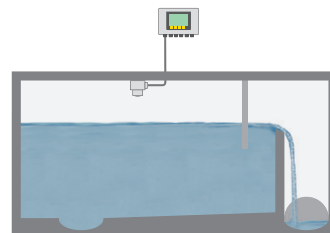
- High system availability through maintenance-free measurement
- Non-sensitive to condensate and buildup
- Controller for level and difference measurement

## Stormwater overflow chambers



### Reliable measurement over the entire measuring range

Stormwater overflow chambers protect sewage treatment plants from capacity overload during periods of heavy rain. If the rainwater overflow basin is unable to hold the accumulating water, part of it is discharged into a river. Due to legal regulations, the impoundment and discharge events must be measured and recorded. Thanks to the high accuracy of the radar sensors, the impounded and discharged water quantities can be measured with just one sensor.



- Exact measurement of the discharged water quantity
- Low sensor height allows a larger impoundment volume
- Safe operation/ adjustment with smartphone – climbing into sewer unnecessary

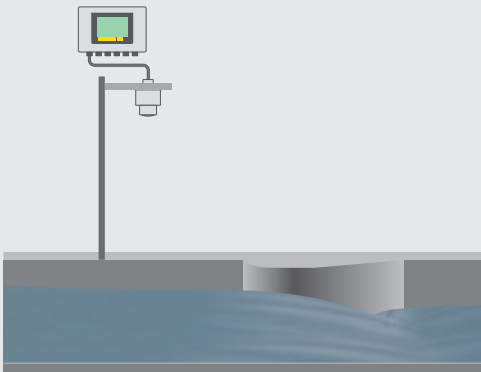
## Open channels



### Unaffected by environmental conditions

Wastewater is often transported to the sewage treatment plant in open channels. The flow rate is measured on flumes and weirs around the plant. The water quantities measured at the inlet and outlet of the sewage treatment plant is used for calculating wastewater charges and consents. The high accuracy of radar sensors, completely unaffected by solar radiation and temperature fluctuations, enables accurate measurement.

- High system availability through maintenance-free measurement
- Flow-proportional output signal by means of integrated flow curves
- Quick setup and commissioning of the controller via application wizards

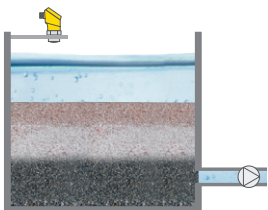


## Sand filter



### Unaffected by environmental conditions

Suspended particles are filtered out in the filter, which is filled with sand and gravel. The water is passed through the filter bed, thereby binding the dirt particles to the sand surface and retaining them. As soon as the filter is heavily soiled, automatic cleaning is triggered; the level in the basin is monitored during the resulting backflushing process, which ensures optimal cleaning.



- Reliable level measurement even with strongly agitated product surface
- Simple installation and maintenance-free operation
- Quick and easy setup and commissioning with smartphone or tablet

## Drinking water reservoir



### Reliable measurement over the entire measuring range

Whereas drinking water is produced in relatively constant quantities, consumption often fluctuates greatly. Drinking water reservoirs are therefore not just storage facilities, but important buffering basins. High availability of the measurement technology is therefore extremely important in maintaining a reliable supply of drinking water. Continuous level measurement with radar ensures that the water reservoir is always adequately filled.



- High supply reliability through dependable measurement
- Simple mounting
- Maintenance-free operation thanks to non-contact measurement



## Small silos for baking ingredients



### Non-sensitive to dust and buildup

One important prerequisite for the smooth operation of many manufacturing processes in the food industry is foresightful stockpiling of ingredients. Smaller silos in particular, e.g. for storing flour, sugar, salt and other ingredients, benefit from the high reliability of radar sensors. The instruments monitor the silo content reliably and ensure a trouble-free production process.



- The non-contact measuring principle is unaffected by dust generation and changing media
- High plant availability, because the sensors are wear and maintenance free
- Simple installation and setup

## Storage tanks for alcohol



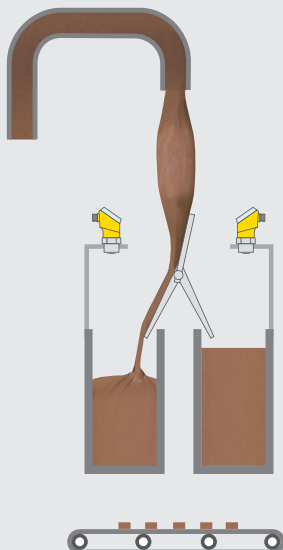
### Reliable measurement over the entire measuring range

In the production of many alcoholic beverages, an exact, unvarying alcohol content is important. But alcohol is also needed in different concentrations, especially for mixed drinks and liqueurs. For exact determination of the quantities present, a reliable level measuring system is required that is influenced neither by the liquid density nor by the gas concentration in the tank.



- Reliable measurement even during filling
- Precise measuring results, independent of process conditions
- Maintenance-free operation thanks to non-contact measuring principle

# SAFE FOOD PRODUCTION



## Filling machine for chocolate

### No interfering signals due to cramped operating space

In the chocolate filling process, precise levels in the portioning containers are especially important. In order to detect the level of the viscous mass even in confined spaces, manufacturers need small radar sensors with a tightly focused measuring field.

- High plant availability through maintenance-free measurement
- Non-sensitive to condensate and buildup
- Simple installation and setup

# SIMPLE BULK SOLIDS MONITORING



## Building materials



### Non-sensitive to dust and buildup

VEGAPULS radar sensors offer precise, non-contact measurement of bulk solids, even under difficult conditions such as in building materials silos. The measuring instruments are mechanically extremely robust. Neither dust nor noise nor buildup on the antennas affect the measuring result. Radar sensors ensure that enough material is available at all times.

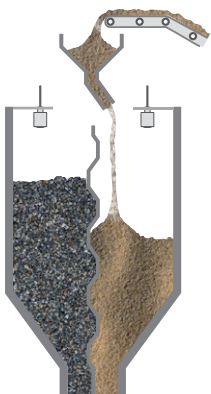
- Reliable measurement despite dust generation and buildup
- Accurate measurement even with deposits on the container walls
- Quick reaction when the level changes rapidly

## Mixing tower



### Reliable measurement through 80 GHz technology

Building materials such as concrete or mortar are required in a wide variety of compositions. The various basic materials are stored in a segmented mixing tower and mixed with cement, lime and other materials in a specific recipe. Level measurement in the individual segments guarantees a high availability of raw materials and efficient operation of the plant.



- Simple mounting of the sensor
- Reliable measurement despite dust, noise and massive internal struts
- High plant availability, because the sensors are wear and maintenance free

## Lime silo



### Unaffected by dust and buildup

In the wastewater industry, lime is used to stabilize the pH value. Stored in large silos, it is added to wastewater as a solid or as an aqueous suspension. Radar sensors deliver reliable readings without effect from ambient conditions such as dust generation. Their narrow signal focusing also allows them to measure reliably even when buildup collects on the vessel walls or on the sensor itself.

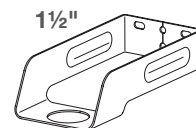
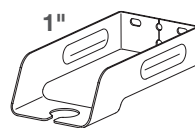


- Reliable measurement even during filling
- Measurement of the entire container volume
- Independent of angle of repose of the material surface



# Overview of mounting accessories for **VEGAPULS**

All versions are available for a mounting connection of thread size 1" for VEGAPULS C 11, C 21 or C 23 on a cable connection or for thread size 1½" for VEGAPULS C 11, C 21, C 22, 11, 21, 31 or Air 41. The 1½" version includes a universal locknut for G, R and NPT threads. The versions MBA and MBE are also available for VEGAPULS Air 42.



Mounting bracket for cable mounting (MBC)			
Mounting bracket for ceiling mounting (MBB)			
Mounting strap for plastic vessels (MBF)			
Mounting bracket 200 mm with fixed sensor mount (MBE)			
Mounting bracket with adjustable sensor mount 80, 200, 400 mm (MBA)			
Mounting bracket with adjustable extension arm Horizontally swivelling (e.g. MBD.AA)			
Mounting bracket with adjustable extension arm Vertically foldable (e.g. MBD.AB)			
Mounting bracket with adjustable extension arm Extendable 500 – 800 mm (e.g. MBD.AC)			

# VEGAPULS **compact version**

	VEGAPULS 11	VEGAPULS 21	VEGAPULS 31
			
Application liquids	√	√	√
Application bulk solids	√	√	√
Measuring range	10 m	20 m	20 m
Antenna	Integrated plastic horn antenna made of PVDF	Integrated plastic horn antenna made of PVDF	Integrated plastic horn antenna made of PVDF
Process fitting	Threads G1½, 1½ NPT	Threads G1½, 1½ NPT	Threads G1½, 1½ NPT
Mounting connection	–	–	–
Process temperature	-40 ... +60 °C	-40 ... +80 °C	-40 ... +80 °C
Process pressure	-1 ... +3 bar (-100 ... +300 kPa)	-1 ... +3 bar (-100 ... +300 kPa)	-1 ... +3 bar (-100 ... +300 kPa)
Accuracy	±5 mm	±2 mm	±2 mm
Frequency range	W-band, 80 GHz	W-band, 80 GHz	W-band, 80 GHz
Beam angle	8°	8°	8°
Signal output: 4 ... 20 mA	√	√	√
4 ... 20 mA/HART	–	√	√
Modbus	–	–	–
SDI-12	–	–	–
Integrated on-site display	–	–	√
Wireless operation	√	√	√
Explosion protection	–	√	√
Protection class	IP66/IP67, Type 4X	IP66/IP67, Type 4X	IP66/IP67, Type 4X
Delivery time	Detailed information on delivery times can be found in the configurator in the web shop at <a href="http://www.vega.com">www.vega.com</a>		

# VEGAPULS **cable version**

VEGAPULS C 11	VEGAPULS C 21	VEGAPULS C 22	VEGAPULS C 23
			
✓	✓	✓	✓
✓	✓	✓	✓
10 m	20 m	20 m	30 m
Integrated plastic horn antenna made of PVDF	Integrated plastic horn antenna made of PVDF	Integrated plastic horn antenna made of PVDF	Integrated plastic horn antenna made of PVDF
Threads G1½, 1½ NPT	Threads G1½, 1½ NPT	Threads G1½, 1½ NPT	–
Threads G1, 1 NPT	Threads G1, 1 NPT	Adapter for ceiling mounting	Threads G1, 1 NPT
-40 ... +60 °C	-40 ... +80 °C	-40 ... +80 °C	-40 ... +80 °C
-1 ... +3 bar (-100 ... +300 kPa)	-1 ... +3 bar (-100 ... +300 kPa)	-1 ... +3 bar (-100 ... +300 kPa)	-1 ... +3 bar (-100 ... +300 kPa)
±5 mm	±2 mm	±2 mm	±2 mm
W-band, 80 GHz	W-band, 80 GHz	W-band, 80 GHz	W-band, 80 GHz
8°	8°	8°	4°
✓	✓	✓	✓
–	✓	✓	✓
–	✓	✓	✓
–	✓	✓	✓
–	–	–	–
✓	✓	✓	✓
–	✓	✓	✓
IP66/IP68, Type 6P	IP66/IP68, Type 6P	IP66/IP68, Type 6P	IP66/IP68, Type 6P

# VEGAMET controllers

	VEGAMET 841/842	VEGAMET 861/862
		
Measured value display	√	√
Point level alarms	√	√
Pump control	√	√
Flow measurement in open channels	√	√
Data logger	–	√
Input	1/2x 4 ... 20 mA sensor input	1/2x 4 ... 20 mA/HART sensor input 2/4x digital input
Output	1/2x 0/4 ... 20 mA current output 3x operating relay 1x fail safe relay (instead of an operating relay)	1/3x 0/4 ... 20 mA current output 4/6x operating relay 1x fail safe relay (instead of an operating relay)
Operating voltage	24 ... 65 V DC 100 ... 230 V AC, 50/60 Hz	24 ... 65 V DC 100 ... 230 V AC, 50/60 Hz
Mounting	Wall/pipe mounting in the field	Wall/pipe mounting in the field
Display	LCD matrix display, black and white backlight with colour change according to status, relay or measured value	LCD matrix display, black and white backlight with colour change according to status, relay or measured value
Adjustment	On-site adjustment with 4 keys, smartphone/tablet/PC and PACTware or VEGA Tools app	On-site adjustment with 4 keys, smartphone/tablet/PC and PACTware or VEGA Tools app
Explosion protection	√	√
Delivery time	Detailed information on delivery times can be found in the configurator in the web shop at <a href="http://www.vega.com">www.vega.com</a>	

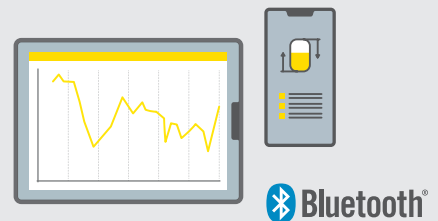
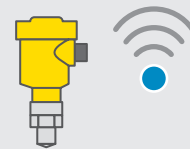
	VEGAMET 141/142	VEGAMET 341/342
		
Measured value display	√	√
Point level alarms	√	√
Pump control	√	√
Flow measurement in open channels	√	√
Data logger	—	—
Input	1/2x 4 ... 20 mA sensor input	1/2x 4 ... 20 mA sensor input
Output	1/2x 0/4 ... 20 mA current output 3x operating relay 1x fail safe relay (instead of operating relay)	1/2x 0/4 ... 20 mA current output 3x operating relay 1x fail safe relay (instead of operating relay)
Operating voltage	24 ... 65 V DC 100 ... 230 V AC, 50/60 Hz	24 ... 65 V DC 100 ... 230 V AC, 50/60 Hz
Mounting	Carrier rail 35 x 7.5 acc. to EN 50022	Panel mounting
Display	LCD matrix display, black and white backlight with colour change according to status, relay or measured value	LCD matrix display, black and white backlight with colour change according to status, relay or measured value
Adjustment	On-site adjustment with rotary knob/push-button, smartphone/tablet/PC and PACTware or VEGA Tools app	On-site adjustment with rotary knob/push-button, smartphone/tablet/PC and PACTware or VEGA Tools app
Explosion protection	√	√
Delivery time	Detailed information on delivery times can be found in the configurator in the web shop at <a href="http://www.vega.com">www.vega.com</a>	

# INTERCONNECTED SOLUTIONS

To ensure that production facilities are competitive today and stay competitive tomorrow, process cycles have to be optimized and costs reduced – without compromising quality. With intelligent networking and unique services, VEGA makes processes noticeably more efficient and reliable throughout the entire value-added chain in food production.

## Wireless operation

With Bluetooth, VEGA is looking far into the future. But even today, radio technology is already making processes more and more flexible. Wireless communication provides better accessibility: In clean rooms, in harsh industrial environments and in hazardous areas. It allows setup, display and diagnostics from a distance of up to 50 metres, thus saving time and avoiding hazardous situations. Simply via VEGA Tools app – on any available smartphone or tablet.



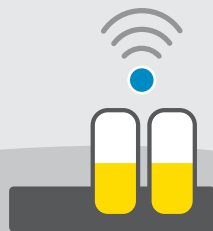
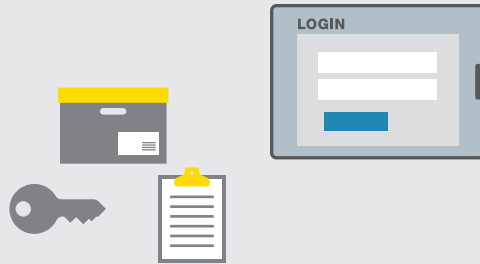


## The advantages of myVEGA

- Generate exact drawings of your instruments
- Get the current prices and delivery times quickly
- Request a quotation specifically tailored to your needs
- Order the products you want directly online
- Find all important order and instrument documents quickly
- Track the status of your order
- Save your instrument settings and documentation in the VEGA Cloud

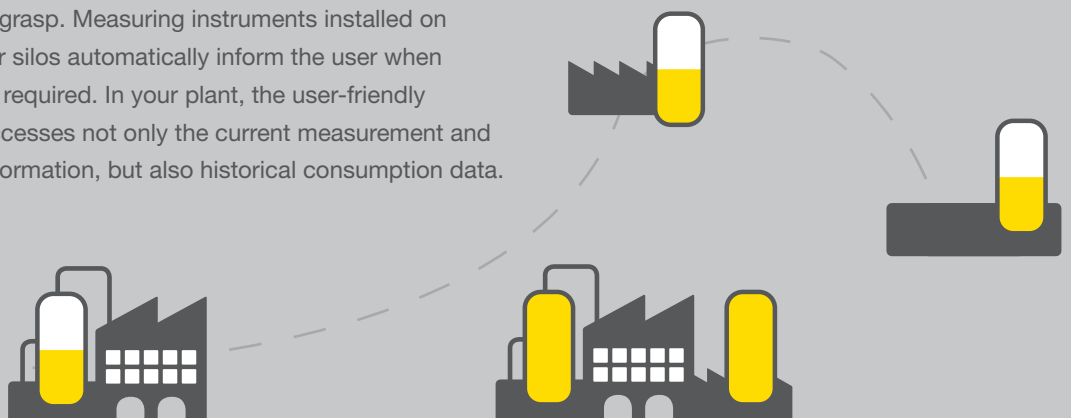
# myVEGA

With myVEGA as your personal information platform you have access to many useful online functions relating to VEGA products.



## VEGA Inventory System

Optimal inventory levels mean lower costs. VEGA Inventory System makes all important process and forecast information visible and easy to grasp. Measuring instruments installed on containers, tanks or silos automatically inform the user when replenishments are required. In your plant, the user-friendly service software accesses not only the current measurement and predicted usage information, but also historical consumption data.



# OUR SERVICE FOR YOU!

**From initial planning to setup or installation advice – we are here for you. Would you like to talk with one of our experts and work out together which sensor best suits your needs? Just get in touch! We're always happy to help and advise, so you can select the right instrument for the job!**

## Training with added value

Our seminars are designed to deliver our technical knowledge and experience to you in the most effective way possible. We can host training sessions at our facilities or come to your location.

## 24-hour service hotline

You can reach our technical support anytime there's an emergency – 24 hours a day.

## Delivery with SPEED

Because time is money, we have a delivery concept called "SPEED". It ensures that our sensors are delivered to you within a few days.

## CONSULTATION

Would you like to receive expert consultation?  
Just give us a call.

### Consultation on products and applications

Mon–Fri from 8:00 AM to 4:00 PM

+49 7836 50-0

## ONLINE

Find the full range of our solutions quickly and conveniently online. User-friendly search functions guide you to the right product with just a few clicks.

[www.vega.com/vegapuls](http://www.vega.com/vegapuls)