Level measurement
Product overview for applications in liquids and bulk solids
Level measurement

Constant product quality, plant safety and economic efficiency und digitalization – these are important aspects for any level measuring point.

Levels in liquids, pastes, bulk solids or liquefied gases are often measured in tanks, silos or movable containers. Examples come from all industry sectors from the chemical and petrochemical industries, the pharmaceutical and life sciences industries, water and wastewater or the food and energy industries.

Level measurement – still leading the way

The broad range of measuring principles available means that finding the ideal solution is easy. No principle is suited to all application areas. Therefore measuring systems must be selected that work reliably under the conditions of a particular application and, at the same time, meet the economic situations in the future.

As the market leader in level measurement, we support you from planning and commissioning through to the maintenance of your measuring point. In addition, we assist you in automation, asset management and the visualization of process data.

Endress+Hauser – Your partner

Endress+Hauser is a global leader in measurement instrumentation, services and solutions for industrial process engineering

With dedicated sales centers and a strong network of partners, Endress+Hauser guarantees competent worldwide support. Our production centers in twelve countries meet your needs and requirements quickly and effectively. The Group is managed and coordinated by a holding company in Reinach, Switzerland. As a successful family-owned business, Endress+Hauser is set to remain independent and self-reliant.

Endress+Hauser provides sensors, instruments, systems and services for level, flow, pressure and temperature measurement as well as analytics and data acquisition. The company supports you with automation engineering, logistics and IT services and solutions. Our products set standards in quality and technology.

We work closely with the chemical, petrochemical, food and beverage, oil and gas, water and wastewater, power and energy, life science, primary and metal, renewable energy, pulp and paper and shipbuilding industries.

Endress+Hauser helps customers to optimize their processes in terms of reliability, safety, economic efficiency and environmental impact.

To learn more about Endress+Hauser, visit: www.endress.com
Oil & Gas: Fuel for thought

We reduce complexities to help you perform, comply and thrive in the Oil & Gas sector

Although markets can be unpredictable, your operation cannot be. Whether upstream or downstream, you need a partner who understands that you must maintain and maximize plant availability – and do it with ever-tighter resources. From exploration to refinery, storage to distribution, and plant upgrades to new projects – we have the application expertise to help you succeed. At a time when the oil and gas industry faces skills shortages and regulations tightening, our organization is here across the full life cycle of your project always with your deadlines in mind. While complexity of facilities and processes are ever increasing, and downtime must be reduced, your competitiveness is enhanced with reliable, accurate and precise measurements. In short, you need to do more with less, benefiting from a stable partner who is here for the long haul and ready across the globe, offering:

- Safety in plant operation
- Optimized production and return on investment (ROI)
- High plant availability

**Advantages at a glance**

- Easy, safe and secure: Bluetooth connectivity for remote operation
- Guided setup sequences: Wizards for easy and intuitive step-by-step guidance via mobile device, Bluetooth or graphic display
- Globally unique Heartbeat Technology for the highest level of system safety and measurement integrity. Mitigating risks by using state of the art technology meeting highest demands with regard to Functional Safety (IEC 61508) and mechanical integrity (e.g. gastight feedthrough)
- Minimizing operational costs through efficient proof testing concepts, predictive maintenance and innovative data management
- Meeting internationally recognized standards and recommendations such as: API, OIML, ASME, NORSOK, NACE etc.
- Increasing plant availability with innovative technologies particularly designed for oil and gas industry applications

**Levelflex Multiparameter**

Employing SensorFusion, Levelflex FMP55 offers you the first combination of the capacitance and guided radar measuring principles in one instrument worldwide. The combination guarantees safe measured value acquisition even in emulsion layers with the simultaneous output of level and interface signals. This makes Levelflex FMP55 Multiparameter the standard in interface measurement.

This solution guarantees the highest degree of safety, precision and efficiency:

- Redundant interface measurement guarantees safe processes
- New, dynamic algorithms for the highest degree of measuring safety and precise measurements
- Multi-Echo Tracking: Increased echo rate and analysis as well as automatic interference echo suppression already during commissioning
- Intuitive, menu-guided operating concept (on-site or via the control system) in the respective national language decreases costs for training, maintenance and operation
- HistorDiM: Data storage for instrument settings and measured values, so that you always have your parameters available
- Exact instrument and process diagnosis for fast decision-making support with clear instructions concerning corrective measures

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**Product highlights**

- **Liquiphant FailSafe FTL81**
  - FailSafe overfill prevention for any liquids
  - Homogeneous redundancy in a device ensures maximum plant safety and allows the device to be used in safety systems with functional safety requirements up to SIL3.

- **Gammapilot FMG50**
  - Radiometric measuring device for challenging process conditions
  - The two-wire compact transmitter has been developed in accordance with IEC 61508 for SIL2/3 and offers maximum plant safety, efficiency and availability. Heartbeat Technology reduces testing effort and minimizes plant downtime.

- **Levelflex FMP55**
  - The Multiparameter device is the innovation in interface measurement
  - Worldwide first combination of two different measuring principles in one device for reliable level and simultaneous interface layer measurement.

- **Micropilot FMR62B**
  - Radar instrument for highest demands in level measurement
  - Maximum reliability even under extreme process conditions like high temperatures or high pressure values. Guided commissioning and intuitive operation with the SmartBlue app.

- **Deltabar PMD78B**
  - Differential pressure transmitter with one/two diaphragm seals for differential pressure and level measurement
  - For measuring differential pressure, level and flow in liquids or gases, especially in applications involving high temperatures and tough conditions.

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- **Micropilot F and Proservo**
  - High-precision measuring devices for custody transfer
  - With an accuracy better than 0.5mm, as confirmed by the NMI and PTB, these devices meet all relevant requirements of OIML R85 and API 3.1B.

Using the measured data, the volume and mass of valuable liquids can be calculated with high precision, thereby saving costs.
Chemical: Competitive and safe

We help you boost your plant’s safety and performance

You gain concrete benefits from a partner who has first-hand knowledge of your sector’s issues around the globe: on increased safety, on environmental protection, on over-supply leading to cost pressure and on finding engineering support and service when required. You can rely on our help to become more competitive in your line of business.

With a long history of industry firsts we have grown with the sector by listening, acting and innovating to better serve you with:

- Safety, built in
- The technology to lead
- Best-fit project management

Advantages at a glance

- Easy, safe and secure: Bluetooth connectivity for remote operation
- Guided setup sequences: Wizards for easy and intuitive step-by-step guidance via mobile device, Bluetooth or graphic display
- Globally unique Heartbeat Technology: for the highest level of system safety and measurement integrity. Meeting internationally recognized standards/recommendations: NAMUR, WHG, ASME, NACE, IEC 17025, MID, OIML
- Internationally accepted hazardous area approvals: ATEX, IECEx, FM/CSA, NEPSI, TIS, INMETRO
- Use of state of the art technology - functional safety according to IEC 61508 (up to SIL3)
- Uniform operating safety by design concepts for simple and safe operations
- Optimized material availability and minimized stocks through inventory management solutions

Electronic differential pressure measurement

Differential pressure measurement is frequently used for level measurement in pressurized vessels or vacuum tanks. Conventional differential pressure systems with impulse lines often suffer from problems including blockage, freezing, leaks and condensation. Even differential pressure systems with oil-filled capillaries reach their limits in applications with fluctuating ambient temperatures.

Our electronic differential pressure system, consisting of a transmitter and two sensor modules, offers tried and tested pressure sensor technology in a new and innovative manner. The transmitter calculates the pressure difference from both sensors and forwards the level, the volume or mass by 4 to 20mA to the control system. This increases reliability as well as safety and reduces costs.

Advantages:

- Reliability: The new electronic differential pressure system eliminates the problems of conventional mechanical systems and leads to higher measuring precision, process availability and reliability.
- Safety: Safety risks are minimized due to the design architecture of the new electronic differential system.
- Cost efficiency: Low overall operating costs due to shorter installation times, lower maintenance, less downtimes and low spare part requirements.

Product highlights

- Liquiphant FTL51B
  Universal point level switch for liquids with Heartbeat Technology
  Developed according to IEC 61508 for SIL2/3 applications. Verification via Bluetooth for Heartbeat Technology without process interruptions in assembled conditions.

- Micropilot FMR62B
  80GHz radar instrument for measurement in aggressive liquids
  Improved focusing and smaller beam angle. Perfectly suitable for tanks with many internal installations.

- Micropilot FMR51
  Radar instrument for highest demands in level measurement
  Maximum reliability under extreme process conditions and due to Multi-Echo Tracking.

- Micropilot FWR30
  The cloud-based level sensor for measuring in mobile and stationary applications
  Particularly suitable for non-invasive measurement of additives in mobile plastic tanks due to battery operation, absence of cables and easy commissioning with digital service.

- Deltabar FMD71/72
  Electronic differential pressure system utilizing one transmitter and two sensors
  Elimination of traditional mechanical issues resulting in greater process availability and reliability.

- Gammapilot FMG50
  Radiometric measuring device for challenging process conditions
  The two-wire compact transmitter has been developed in accordance with IEC 61508 for SIL2/3 and offers maximum plant safety, efficiency and availability. Heartbeat Technology reduces testing effort and minimizes plant downtime.
Mining, Minerals & Metals: Extracting more from less

In a world of lower grades, skills gaps and excavation challenges we can help you hit your targets

We’ve seen how lower grades are driving an acute need for ever-better automation and controls. You are also facing emerging skills gaps, requiring better-informed industry partners.

At the same time, energy costs are only going one way, and the legislative environment is becoming increasingly stringent.

Tough challenges call for experienced heads who can:

- Reduce your metal and mineral production costs
- Keep your plant safe
- Boost compliance and responsibility

Advantages at a glance

- Easy, safe and secure: Bluetooth connectivity for remote operation
- Guided setup sequences: Wizards for easy and intuitive step-by-step guidance via mobile device, Bluetooth or graphic display.
- Globally unique Heartbeat Technology: for the highest level of system safety and measurement integrity.
- Complete product basket for all applications, specifically in harsh environments
- Advanced diagnostic functionalities to make the process more safe and reliable
- Savings in raw material, water, energy and labor through accurate data of critical and quality relevant points in your process
**Food & Beverage: Trust in quality**

We help you to improve quality while reducing operational costs

From hygiene regulations and food safety to the basic demands of reliability and uptime, high quality food & beverage producers profit from our experience in more than 100 countries.

Get it right the first time and make your safe choice:
- Constant food quality & compliance
- Resources savings
- An expert partner

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**Advantages at a glance**

- Complete basket of 3-A, FDA and EHEDG approved level measurement solutions
- Food safety and reliability due to instruments designed and manufactured specifically for all requirements in food & beverage industry
- Savings in raw material, water, energy and labor through accurate data of critical and quality relevant points in your process
- Optimized material availability and minimized stocks through inventory management solutions

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**Exact knowledge of hygienic condition of plant opens up new possibilities**

Many food production processes take place within closed systems. While these system are designed to prevent the ingress of unwanted contaminants from the environment, they also make it difficult to determine the effectiveness of cleaning processes. If a process is closed off from the outside, it is impossible to see from the outside how clean it is. This is where the new Liquitrend QMW43 technology from Endress+Hauser comes in. By means of capacitive and conductive measuring technology, the customer is able to gain direct insight into their plant. The stainless steel measuring head reflects the condition of the inside of pipes, for example, and continuously measures the thickness of any buildup that occurs during the production process or is still present following cleaning. In addition, the device continuously outputs information on the conductivity of the medium at the sensor. These two continuous measurements facilitate decision-making, verifiably reduce cleaning times and therefore also save resources.

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**Product highlights**

- **Liquiphant FTL33**
  Most universal point level switch for all kinds of pumpable liquids
  Fully welded and independent from medium and mounting position.

- **Deltapilot MB70**
  Highest performance pressure sensor with the Contite measuring cell
  Made for level measurement in liquid and past-like media in open or closed containers and unaffected by possible foam formation.

- **Nivector FTI26**
  Cost-effective point level switch
  Perfect fit to the hygienic industry thanks to flush-mounted design and extended build-up compensation for reliable detection in sticky and pasty media.

- **Liquitrend QMW43**
  Detect media and blending homogeneity quickly
  The Liquitrend QMW43 enables continuous measurement of medium buildup on the sensor and the actual level of conductivity present. This measurement can be used to adapt and optimize cleaning cycles as needed, recognize media and monitor mixing processes.

- **Liquicap FM51**
  Continuous level measurement with capacitance probes provides fastest response times
  For water based media the devices are already pre-calibrated ex works. Used in conjunction with the Fieldgate FIA320, the ideal solution for inventory management and logistics optimization.

- **Microplilot FMR63B**
  80GHz radar instrument for hygienic applications
  3-A and EHEDG approvals. Improved focusing and smaller beam angle: particularly for small tanks and tanks with a lot of internal installations.

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**Level measurement**

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Life Sciences: The pulse of life sciences

Trust a reliable partner who helps you achieve operational excellence

It is a daily task to meet stringent GxP regulations and productivity goals throughout your product lifecycle. You can count on our world-class instruments, designed to ASME-BPE standards, but also our highly qualified engineering input and experienced service teams. We partner with you to generate process optimization, higher plant availability and continuous improvement.

Our experience, gained at the heart of the sector, will help you to:
- Get to market faster
- Boost productivity - manage risk

Advantages at a glance
- Measurement instruments that fully comply with the numerous requirements, codes and standards, such as FDA, ISPE, GAMP, ASME-BPE, EU1935/2004, etc.
- Advanced diagnostics guarantees highest process safety and efficiency
- Products designed for high temperatures and pressures during CIP and SIP processes
- Delivery of products with all required approvals (material certificates for the process wetted parts, certificates of compliance, calibration certificates, surface roughness finish certificates, test reports, etc.)

Guided radar in bioprocesses

Level measurement in bioprocesses is quite demanding on the instrumentation. Changing densities, temperature shocks, hygiene requirements, continually moist surfaces and foam formation with different consistencies may not impair the instrument.

The constructive design of the Levelflex FMP53 instrument type has been particularly devised for the highest hygiene requirements in the life sciences industry. The instrument complies with the ASME-BPE recommendations.

The mode of operation is independent on density and thus the guided radar measurement is optimally suited to this application. The small vessels frequently found in bioprocesses prompted optimizing of the measuring method. Consequently, the level may now be safely acquired in a 10 liter vessel.

Employing Multi-Echo Tracking – for the reliable measurement even in sophisticated measuring tasks – as well as HistoROM for an easy exchange of electronics without any additional aids, Levelflex increases availability and reduces costs. The operator is pleased with the additional simplification of calibration due to the possibility of verification in assembled conditions. The availability of all hygiene process connections facilitates engineering and planning.

Product highlights

Liquiphant FTL50H
Compact, hygienic point level switch with stainless steel housing
Used as overfill prevention system or for pump protection, ideally for storage tanks, mixing tanks and pipes.

Levelflex FMP53
Continuous level measurement for hygienically sensitive applications
Meets all hygienic requirements according to ASME-BPE and USP Class VI. Unique in situ validation without dismantling from the process.

Liquipoint FTW33
Conductive point level detection
Perfect fit to the hygienic industry thanks to flush-mounted design and extended build-up compensation for reliable detection in sticky and pasty media.

Deltapilot FMB70
Hydrostatic pressure sensor with the Contite cell for level measurement
Condensate resistant Contite measuring cell and two-chamber housing. Unaffected by possible foam formation.

Micropilot FMR63B
80GHz radar instrument for hygienic applications
Approved according to ASME-BPE and USP Class VI. Improved focusing and smaller beam angle: particularly for small tanks and tank with many internal installations.
Micropilot FWR30
The cloud-based level sensor for mobile and stationary applications
Suitable for non-invasive measurement of liquids, pastes and slurries. Not affected by changing media, temperature changes, gas blankets or vapors.

Waterpilot FMX11
Straightforward and reliable level measuring probe for freshwater applications
Certified for drinking water applications and can be used in fountains, storage tanks, water towers, dams, gaging stations, lakes and rivers.

Waterpilot FMX167
Reliable and robust level probe with ceramic measuring cell
Certified for drinking water with a robust ceramic sensor and integrated temperature measurement. Also for usage in wastewater and salt water applications.

Liquicap FMI52
Continuous level and interface measurement
Reliable rope probe for continuous level monitoring in liquids, particularly in small tanks, build-up forming media and extremely high temperatures.

Deltapilot FMB53
Hydrostatic pressure sensor with Contite measuring cell
Hermetically sealed Contite measuring cell with condensate-resistance, high reference accuracy and minimum temperature effects.

Water & Wastewater: Water is our life
Increase your efficiency and ensure compliance with an experienced and trusted partner

As budgets shrink and legislative demands soar, we bring expertise for challenging needs.
Safe potable water... discharges, environmental penalties... water infrastructure for developing countries... energy monitoring... the rising quantities of sludge from wastewater treatment and the opportunities they create for biogas. We make sense of it all, with experienced thinking supported by process technology solutions for your every need.

Through working with water in over 100 countries, Endress+Hauser offers a refreshing alternative.

Advantages at a glance
• Easy, safe and secure: Bluetooth connectivity for remote operation
• Guided setup sequences: Wizards for easy and intuitive step-by-step guidance via mobile device, Bluetooth or graphic display.
• Globally unique Heartbeat Technology: for the highest level of system safety and measurement integrity.
• Cost-effective product and service portfolio for any applications, e.g. for drinking water, wastewater and sewage, desalination.
• Meeting internationally recognized standards/recommendations for drinking water applications.
• Highest efficiency by easy commissioning, operation and maintenance of instruments.

Radar measurement in water and wastewater applications
Radar technology is particularly suited to continuous measurement of levels in water and wastewater applications. Temperature fluctuations do not impair the measurement of the non-contact and free of maintenance devices.

Especially the new Micropilot FMR10 and FMR20 offering best application fit for level measurement in storage tanks, open basins, pump/lift stations or in the sewer management. Commissioning, operation and maintenance is possible via Bluetooth® wireless technology with the Endress+Hauser SmartBlue app or via HART. The most compact radar in class fits also in limited space applications due to its unique chip design.

Advantages:
• Long sensor lifetime thanks to full PVDF body
• Hermetically sealed wiring and fully potted electronics eliminating water ingress and allows operation under harsh environmental conditions
• Best price-performance-radar

Prosonic FMU90/FDU90
Ultrasonic sensor for level and flow measurement
Measurement is unaffected by dielectric constant, density or humidity and also unaffected by build-up due to the self-cleaning effect of sensors.

Micropilot FMR10/FMR20
Basic radar for liquid level applications
For non-contact level and flow measurement, e.g. basins, channels, river monitoring. With Bluetooth® commissioning, operation and maintenance app.

Micropilot FMR60B
Radar instrument for liquid level applications with 80GHz technology
Used for continuous, non-contact level measurement of liquids in plastic tanks and in overflow basins and channels, due to battery operation, absence of cables and easy commissioning with digital service.
Today’s Power & Energy industry must strike a complex balance: meeting spiraling demand for affordable and reliable energy while increasing cleaner and renewable sources in the energy mix. As cost and regulatory pressures grow, modernization is essential for efficient, safe resource use. As renewables advance, so does the need for energy storage. With best-fit instrumentation, deep power application expertise, services and solutions, Endress+Hauser brings efficient, reliable productivity.

When you choose us, you:
- Boost the efficiency of your plant
- Improve safety
- Retain expertise

![Levelflex FMP54](image)

**Levelflex FMP54**

Guided radar for high temperature and high pressure applications

- Integrated ceramic-graphite seal safeguards reliable level measurement in steam boilers up to 450°C/400bar (842°F/5,800psi).

**Advantages at a glance**

- Easy, safe and secure: Bluetooth connectivity for remote operation
- Guided setup sequences: Wizards for easy and intuitive step-by-step guidance via mobile device, Bluetooth or graphic display
- Globally unique Heartbeat Technology: for the highest level of system safety and measurement integrity
- Functional safety: IEC 61508 SIL2/3 certified
- EN12952-11 (water tube boiler), EN12953-09 (shell type boiler) for guided radar instruments and DP transmitter
- Intelligent instruments with continuous self-monitoring
- Pressure directives such as PED, AD2000, CRN, EN13480
- Minimized downtime and highest safety through modern instrumentation

**Guided radar for extreme conditions**

Levelflex FMP54 is predestined for level measurement in liquids under extreme conditions. The design of the process connection with a ceramic-graphite seal guarantees safe processes both in high temperatures and pressures as they occur in steam boilers and in toxic media, e.g. ammonia. The second gas-tight feedthrough guarantees additional safety.

For steam boiler applications, Levelflex FMP54 offers the option of a gas phase compensation. This feature guarantees safe and precise level measurement even under the highest process pressures. In case of gas phases in a steam boiler, conventional guided radar devices determine measured values which are strongly deviating from the actual level. Only the gas phase compensation of Levelflex provides you with reliable and precise measuring results if gas and steam phases or high pressures occur.

**Advantages:**

- SIL2 according to IEC 61508, SIL3 in case of homogeneous redundancy
- The easiest verification test for SIL and WHG worldwide
- High diffusion resistance due to ceramic coupling and graphite seal
- Resistant against steam
- Available with rod, rope and coax probe

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**Solicap FTI77**

Point level detection for bulk solids, especially for high temperatures and strong mechanical loads

- Sword/rope probe for point level detection up to 400°C (752°F) of fine-grained to coarse-grained bulk solids, such as fly ash.

**Sonicap FTI77**

Point level detection for bulk solids, especially for high temperatures and strong mechanical loads

- Sword/rope probe for point level detection up to 400°C (752°F) of fine-grained to coarse-grained bulk solids, such as fly ash.

**Micropilot FMR67B**

For highest demands in bulk solids level measurement up to 450°C (842°F)

Thanks to 80GHz technology, reduced tank wall reflections and interferences through tank installations. Large measuring range up to 125m (410ft) possible.

**Liquiphant FTL64**

Point level switch for liquids in high-temperature applications with Heartbeat Technology

- Suitable for high-temperature applications up to 280°C (536°F). Developed according to IEC 61508 for SIL2/3 applications; second process seal (2nd line of defense) guarantees high degree of safety and availability.
- Verification via Bluetooth and Heartbeat Technology while installed and without interrupting the process.

**Cerabar PMP71B**

Digital pressure transmitter with metallic measuring cell, optionally with fully welded diaphragm seal

- For pressure, level, volume or mass measurement in liquids or gases. Designed for high pressure applications up to 700bar (10,500psi) and extreme temperature conditions.

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# Overview of measuring principles

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Continuous level measurement in liquids
Choose the measuring principle which fits best for your application

Radar
Micropilot works with either pulses or with Frequency Modulated Continuous Wave (FMCW). Pulse: High-frequency radar pulses which are emitted by an antenna and reflected from the product surface. The time between pulse launching and receiving is measured and analyzed by the instrument and constitutes a direct measure for the distance between the antenna and the surface of the medium. FMCW: Works with an FMCW continuous electromagnetic wave which is emitted from an antenna and reflected by the product surface. The frequency change “Δf” is measured and the time and distance are calculated.

Guided radar
Levelflex works with high-frequency radar pulses which are guided along a probe. As the pulse impacts the medium surface, the characteristic impedance changes and part of the emitted pulse is reflected. The time between pulse launching and receiving is measured and analyzed by the instrument and constitutes a direct measure for the distance between the process connection and the product surface.

Ultrasonics
Prosonic is based on the Time-of-Flight principle. A sensor emits ultrasonic pulses, the surface of the media reflects the signal and the sensor detects it again. The Time-of-Flight of the reflected ultrasonic signal is directly proportional to the distance traveled. With the known tank geometry the level can be calculated.

Hydrostatics
Hydrostatic level measurement in open tanks is based on the determination of the hydrostatic pressure which is generated by the height of the liquid column. The obtained pressure is thus a direct measure for the level. In closed vessels with overpressure, the differential pressure measured is a direct indicator of the level.

Capacitance
The principle of capacitive level measurement is based on the capacitance change of a capacitor. The probe and the tank wall form a capacitor whose capacitance is dependent on the amount of product in the tank: An empty tank has a lower, a filled tank a higher capacitance.

Radiometry
The radiometric measuring principle is based on the fact that gamma radiation is attenuated when it penetrates a medium. The radiation source is installed in a source container, which allows the radiation to be emitted only in the direction of the process vessel. The detector is positioned on the opposite side of the process vessel. It converts the received radiation into an electrical signal and uses it to calculate the level.

Servo
When the displacer is lowered and comes into contact with the liquid, the weight of the displacer is reduced by the buoyancy force of the liquid, which is measured by a temperature-compensated magnetic transmitter. This changes the torque in the magnetic connection, which is measured by six Hall sensors. A signal indicating the weight of the displacer is sent to the motor control circuitry. As soon as the liquid levels rise or fall, the drive motor adjusts the position of the displacer. The rotation of the measuring drum is analyzed continuously to determine the level value using a magnetic encoder.
Radar level measurement is a safe solution for liquids under extreme process conditions (pressure, temperature) and vapors. The Micropilot can also be used in hygienic applications for non-contact level measurement.

Advantages at a glance
- Hardware and software developed according to IEC 61508 for SIL2 (Min./Max. range) respectively SIL3 (homogeneous redundancy)
- Highest process safety due to Multi-Echo Tracking evaluation
- Non-contact measurement, free of wear and tear, that can be used in extreme process conditions
- Heartbeat Technology for a cost-effective and safe plant operation during the entire life cycle
- Safe measurement in vessels with changing products
- Reliable measurement due to advanced dynamics signal strength

Guided radar pulse measurement is well suited to liquids. The surface condition of the medium is of minor importance due to the safe guidance of the reflected waves. Reliable measurement is also safeguarded in turbulent liquid surfaces or foam formation. Guided radar is also first choice for interface measurement.

Advantages at a glance
- Hard- and software developed according to IEC 61508 for SIL2 (Min./Max./range) respectively SIL3 (homogeneous redundancy)
- Highest process safety due to Multi-Echo Tracking evaluation
- Reliable measurement in liquids with turbulent surfaces and foam formation
- Simple commissioning due to precalibrated sensor
- Heartbeat Technology for a cost-effective and safe plant operation during the entire life cycle
- Ideally for the direct replacement of displacers in existing displacer chambers
Ultrasound – the Prosonic

The ultrasonic method is a tried and tested, as well as cost-effective solution for level measurement in liquids. Instruments are available as compact or separate versions. This measuring principle is characterized by easy planning and assembly, fast and safe commissioning, a long service life and reduced maintenance costs. Typical applications include abrasive and aggressive media, even in rough ambient conditions, but also tasks in water and wastewater engineering.

The ultrasonic measuring method is characterized by the following advantages:

- Unaffected by product properties, e.g. dielectric constant or density
- Easy and fast commissioning due to preset application parameters
- Calibration without filling or discharging

Hydrostatic – the Waterpilot, the Deltapilot, the Cerabar, the Deltabar

Hydrostatic pressure sensors for level measurement may be used in almost all liquid media, from water through to pastes and sludges. Even under difficult process conditions, these sensors may be adjusted to the application in an optimum fashion. Differential pressure transmitters are used for level measurement in pressurized tanks and also in abrasive and corrosive media.

The Waterpilot, Deltapilot, Cerabar and Deltabar portfolio for applications in liquids

- Waterpilot FMX11/FMX21
  - Level probe for freshwater (FMX11/21), wastewater and salt water (FMX21)
  - Temperature: -30 to +70°C (-22 to +158°F)
  - Measuring range: 100mbar to 40bar
  - Accuracy: ±0.5% (FMX11), ±0.35% (FMX21)
  - Optional: ±0.1% (FMX21)

- Waterpilot FMB50/51/52/53
  - Pressure sensor with Centro cell for hydrostatic level measurement in liquid and past-like media
  - Temperature: -30 to +100°C (-22 to +212°F)
  - Measuring range: 100mbar to 10bar
  - Accuracy: ±0.5% (FMB50), ±0.3% (FMB51/52/53)
  - Optional: ±0.1% (FMB51/52/53)

- Deltapilot PM51B/PM52B
  - Digital pressure transmitter with metal sensor for measurement of pressure differences
  - Temperature: -40 to +120°C (-40 to +248°F)
  - Measuring range: 100mbar to +40bar
  - Accuracy: ±0.5% (PM51B), ±0.3% (PM52B)
  - Optional: ±0.1% (PM52B)

- Deltapilot PM71B
  - Digital pressure transmitter with metal sensor for measurement of pressure differences
  - Temperature: -40 to +120°C (-40 to +248°F)
  - Measuring range: 100mbar to +40bar
  - Accuracy: ±0.5% (PM71B), ±0.3% (PM71B)
  - Optional: ±0.1% (PM71B)

- Cerabar PMC51B/PMC71B
  - Digital pressure transmitter with ceramic sensor for level, absolute and gauge pressure measurement
  - Temperature: -40 to +150°C (-40 to +302°F)
  - Measuring range: 100mbar to 40bar
  - Accuracy: ±0.05% (PMC51B), ±0.02% (PMC71B)
Capacitance – the Liquicap

Capacitance level measurement covers a wide range of applications which are not limited to process engineering. Simple and cost-effective probes offer a wealth of possibilities for level monitoring in liquids, particularly in small tanks, build-up forming media and extremely high temperatures. Certain interface measurements can also be solved with capacitance probes. Capacitance probes can also be used in processes with fast changes in the tank level.

Liquicap FMI51
For continuous level and interface measurement in liquids
• Temperature: -80 to +200°C (-112 to +392°F)
• Pressure: Vacuum to +100bar (vacuum to +1,450psi)
• Measuring range: 0.1 to 4.0m (0.3 to 13ft)

Liquicap FMI52
For continuous level and interface measurement in liquids - for large measuring ranges
• Temperature: -80 to +200°C (-112 to +392°F)
• Pressure: Vacuum to +100bar (vacuum to +1,450psi)
• Measuring range: 0.42 to 10.0m (1.38 to 33ft)

Liquicap FMI21
For continuous level measurement in conductive liquids
• Temperature: -40 to +100°C (-40 to +212°F)
• Pressure: Vacuum to +10bar (vacuum to +145psi)
• Measuring range: up to 2.5m (8ft)

Advantages at a glance
- Accurate measurement in small tanks
- Short response times
- Measurement from probe end to process connection, no blocking distance
- Technology proved in millions of applications
- Interface measurement independent of emulsion layers

Radiometry – the Gammapilot

Gamma instruments are used increasingly in applications where other measuring principles are no longer effective due to extreme process conditions or mechanical, geometric or structural conditions. Radiometric instruments work without contact with the process. They are installed externally on the tank or pipe and measure through the vessel wall. This measurement method is therefore suitable for use in a wide range of media, regardless of the medium properties.

Gammapilot FMG50
The two-wire compact transmitter for point level detection, continuous level measurement, interface, density and concentration measurement
• Temperature: No limitation (non-invasive, extraneous)
• Pressure: No limitation (non-invasive, extraneous)

Source container FQG61/62
Radiation source container with source holder for manual or pneumatic switch-on/switch-off
• Weight: 40kg (FQG61); 87kg (FQG62)
• Measuring range: 0.1 to 4.0m (0.3 to 13ft)

Source container FQG63
Lightweight radiation source container with flexible extension element for source
• Temperature: -52 to +400°C (-62 to +752°F)
• Weight: 8.7kg

Source container FQG60
Radiation source container with radiation source insert for manual or pneumatic switch-on and switch-off
• Weight: 18kg
• Pressure: No limitation (non-invasive, extraneous)

Source container FQG66
Lightweight radiation source container with flexible extension element for source
• Temperature: -52 to +400°C (-62 to +752°F)
• Weight: 435kg
• Pressure: No limitation (non-invasive, extraneous)

Advantages at a glance
- Non-contact, external measurement for the highest degree of safety and reliability under the most extreme process conditions
- 2-wire loop-powered compact transmitter
- Functional safety up to SIL2/3 according to IEC 61508
Our tank gauging instruments are used for custody transfer and inventory control applications with NMi- and PTB-approvals and meet the requirements according to OIML R85 and API 3.1B.

**Advantages at a glance**
- Hardware and software developed according to IEC 61508 up to SIL3 (in homogeneous redundancy) for high level of safety
- Maximum reliability through accuracy up to ±0.4mm (±0.02”)
- Developed according to international metrology recommendations such as OIML R85 and API MPMS
- Local and country-specific certifications like NMi or PTB for custody transfer applications
- Simplified installation and trouble-free operations due to easy connection to major DCS systems via open protocols
Continuous level measurement in bulk solids

Choose the measuring principle which fits best for your application.

Radar

Micropilot works with either pulses or with Frequency Modulated Continuous Wave (FMCW). Pulse: High-frequency radar pulses which are emitted by an antenna and reflected from the product surface. The time between pulse launching and receiving is measured and analyzed by the instrument and constitutes a direct measure for the distance between the antenna and the surface of the medium. FMCW: Works with an FMCW continuous electromagnetic wave which is emitted from an antenna and reflected by the product surface. The frequency change “Δf” is measured and the time and distance are calculated.

Guided radar

Levelflex works with radar pulses guided along a probe. As the pulses meet the medium surface, part of the emitted pulse is reflected due to a change of the DC value between the air and the medium. The time between pulse launching and receiving is measured and analyzed by the instrument and constitutes a direct measure for the distance between the process connection and the product surface.

Ultrasonics

Prosonic works with ultrasonic pulses which are emitted by a sensor, reflected by the surface of the medium due to a change of the density between the air and the medium and again acquired by the sensor. The required Time-of-Flight is a measure for the distance travelled in the empty part of the silo. This value is deducted from the overall height of the silo to yield the level.

Electromechanical level system

A weight is lowered on a measuring tape. As it meets the surface of the bulk solids, the tensile force of the weight is reduced. This change is recognized, the instrument reverses the sense of rotation of the motor and rewinds the tape. A pulse generator counts the rotations in a non-contact manner as the weight is lowered. Each counted pulse corresponds to an exactly defined distance. If this distance is deducted from the overall distance (height of the vessel), the level results.

Radiometry

The radiometric measuring principle is based on the fact that gamma radiation is attenuated when it penetrates a medium. The radiation source is installed in a source container, which allows the radiation to be emitted only in the direction of the process vessel. The detector is positioned on the opposite side of the process vessel. It converts the received radiation into an electrical signal and uses it to calculate the level.

Advantages

- Non-contact, maintenance-free measurement
- Unaffected by product properties like density
- Unaffected by temperature, filling noise and dust development
- Unaffected by vessel materials
- Freely adjustable measuring range

Advantages

- Unaffected by product properties
- Light bulk solids
- Unaffected by DC value

Advantages

- Non-contact measurement from outside
- Made for extreme measuring tasks where other principles can not be used

Advantages

- Non-contact, maintenance-free measurement
- Unaffected by product properties, e.g. DC value, density, etc.
- Calibration without filling or discharging
- Self-cleaning effect
- Cost-effective instrumentation for silo farms with FMU95 multichannel system
Radar – the Micropilot

Radar level measurement is a safe solution under extreme process conditions and vapors. The development of this measuring principle led to its use in bulk solid applications, since it is unaffected by dust and noise.

Micropilot FMR10/FMR20
Basic model for level measurement in bulk solids
- Temperature: -40 to +80°C (-40 to +176°F)
- Pressure: -1 to +3bar (-14.5 to +43psi)
- Measuring range: up to 15m (49 ft)

Micropilot FWR30
The cloud-based level sensor for stationary and mobile applications
- Temperature: -20 to +60°C (-4 to +140°F)
- Measuring range: up to 15m (49 ft)

Guided radar – the Levelflex

Guided radar pulse measurement is well suited to bulk solids. The surface condition of the medium is of minor importance due to the safe guidance of the reflected waves. Different angled surfaces or outflow funnels, as they occur in bulk solids, do not influence measurement.

Levelflex FMP56
Economically efficient basis model for all level applications in bulk solids
- Temperature: -40 to +120°C (-40 to +248°F)
- Pressure: up to +16bar (up to +232psi)
- Measuring range: up to 12m (39 ft)

Levelflex FMP57
The sensor for highest demands for level measurement in bulk solids
- Temperature: -40 to +185°C (-40 to +365°F)
- Pressure: up to +16bar (up to +232psi)
- Measuring range: rod up to 4m (13 ft), rope up to 45m (148 ft)

Advantages at a glance
- Hard- and software developed according to IEC 61508 for SIL2 (Min./Max. range) respectively SIL3 (homogeneous redundancy)
- Highest process safety due to Multi-Echo Tracking evaluation
- Non-contact measurement, free of wear and tear, that can be used in extreme process conditions
- Vapors or dusts do not affect the measurement
- Safe measurement in silos with changing product
- Reliable measurement due to advanced dynamics signal strength
- Heartbeat Technology for a cost-effective and safe plant operation during the entire life cycle

Advantages at a glance
- Hard- and software developed according to IEC 61508 for SIL2 (Min./Max./range) respectively SIL3 (homogeneous redundancy)
- Highest process safety due to Multi-Echo Tracking evaluation
- Safe measurement in bulk solids and in applications with strong dust formation
- Simple commissioning due to precalibrated sensor
- Heartbeat Technology for a cost-effective and safe plant operation during the entire life cycle
Ultrasonic – the Prosonic

The ultrasonic method is a proved, as well as cost-effective, solution for level measurement of bulk solids. Instruments are available as compact or separate versions. This measuring principle is characterized by easy planning and assembly, fast and safe commissioning, a long service life and reduced maintenance costs. Typical applications include abrasive and aggressive media, even in rough environments.

The Prosonic portfolio for applications in bulk solids

- **Prosonic FMU40/41/42/44**
  - Cost-effective device for sophisticated level measurement in bulk solids
  - Temperature: -40 to +80°C (-40 to +176°F)
  - Pressure: +0.7 to +3bar (+10 to +44psi)
  - Measuring range: up to 10m (33ft)

- **Prosonic FDU90/91/92/93/95**
  - Ultrasonic sensor for level and flow measurement for connection to FMU9x
  - Temperature: -40 to +150°C (-40 to +302°F)
  - Pressure: +0.7 to +4bar (+10 to +58psi)
  - Measuring range: up to 45m (148ft)

- **Prosonic FMU90/95**
  - Transmitter in housing for field or top hat rail mounting for up to 10 sensors
  - Calculations: Average, difference, sum
  - Ambient temperature: -40 to +60°C (-40 to +140°F)
  - Accuracy: ±2mm + 0.17% of the adjusted measuring range

- **Prosonic FDU91F**
  - Hygienic sensor for level measurement for connection to FMU9x
  - Temperature: -40 to +105°C (-40 to +221°F), 30min., +135°C (+275°F)
  - Pressure: +0.7 to +4bar (+10 to +58psi)
  - Measuring range: up to 5m (16ft)

- **Prosonic FMU30**
  - Cost-effective all-round instrument for level applications in bulk solids
  - Temperature: -40 to +60°C (-40 to +140°F)
  - Pressure: +0.7 to +3bar (+10 to +44psi)
  - Measuring range: Sensor 1½” up to 2m (6.6ft), sensor 2” up to 3.5m (11ft)

Electromechanical level measurement – the Silopilot

Old seafarers used a weight on a rope to test the depth to the bottom of the sea. In industrial level measurement, the basic idea of sounding is still utilized in the electromechanical level system. Where other measurement methods are limited, applications involving bulk solids predominantly use electromechanical level measurements.

The Silopilot portfolio for applications in bulk solids

- **Silopilot FMM50**
  - For continuous level measurement even in high bulk solids silos or bins
  - Temperature: -20 to +230°C (-4 to +446°F)
  - Pressure: +0.8 to +3bar (+11.6 to +43.5psi)
  - Measuring range: up to 90m (295ft)

- **Silopilot FMM20**
  - Basic model for continuous level measurement in light bulk solids
  - Temperature: -20 to +150°C (-4 to +302°F)
  - Pressure: +0.8 to +1.1bar (+11.6 to +15.95psi)
  - Measuring range: up to 32m (105ft)

Advantages at a glance

- Unaffected by product properties, e.g. density or moisture
- Easy and fast commissioning due to preset application parameters
- Calibration without filling or discharging

Advantages at a glance

- Proved, reliable measurement up to 90m (295ft)
- Safe measurement in extremely dusty environments
- Robust system with high tensile force prevents breakdown due to an immersed weight
- Compact instrument with 4 to 20mA current output as well as additional freely programmable signal outputs (e.g. counting pulses, relays)
Radiometry – the Gammapilot

Gamma instruments are used increasingly in applications where other measuring principles are no longer effective due to extreme process conditions or mechanical, geometric or structural conditions. Radiometric instruments work without contact with the process. They are installed externally on the tank or pipe and measure through the vessel wall. This measurement method is therefore suitable for use in a wide range of media, regardless of the medium properties.

The Radiometry portfolio for applications in bulk solids

1. Gammapilot FMG50
   - The two-wire compact transmitter for point level detection, continuous level measurement, interface, density and concentration measurement
   - Temperature: No limitation (non-invasive, extraneous)
   - Pressure: No limitation (non-invasive, extraneous)

2. Gamma Modulator FHG65
   - Effective suppression of background and extraneous radiation
   - Temperature: No limitation (non-invasive, extraneous)
   - Pressure: No limitation (non-invasive, extraneous)

3. Source container FGQG61/62
   - Radiation source container with source holder for manual or pneumatic switch-on and switch-off
   - Weight: 40kg (FGQG61); 87kg (FGQG62)
   - Pressure: No limitation (non-invasive, extraneous)

4. Source container FGQG63
   - Lightweight radiation source container with flexible extension element for source
   - Temperature: -52 to +400°C (-62 to +752°F)
   - Weight: 87kg
   - Pressure: No limitation (non-invasive, extraneous)

5. Source container FGQG60
   - Radiation source container with radiation source insert with manual switch-on and switch-off
   - Weight: 38kg
   - Pressure: No limitation (non-invasive, extraneous)

6. Source container FGQG66
   - Radiation source container with switch holder for manual or pneumatic switch-on and switch-off
   - Weight: 435kg
   - Pressure: No limitation (non-invasive, extraneous)

7. Source container FGQG60
   - Radiation source container with radiation source insert with manual switch-on and switch-off
   - Weight: 38kg
   - Pressure: No limitation (non-invasive, extraneous)

Advantages at a glance
- Non-contact, external measurement for the highest degree of safety and reliability under the most extreme process conditions
- 2-wire loop powered compact transmitter
- Functional safety up to SIL2/3 according to IEC 61508
**Point level detection in liquids**

Choose the measuring principle which fits best for your application.

**Vibronic**

A sensor in the form of a tuning fork is excited at its resonant frequency. The drive works piezoelectrically. The oscillating frequency changes as the fork enters the medium. The change is analyzed and translated into a switching signal.

**Advantages**
- Unaffected by media
- Ready for use without calibration
- Self-monitoring
- Can be used in turbulent and effervescent liquids

**Capacitance**

A capacitance probe may be compared to an electric capacitor. As the tank is filled, the probe capacity increases. This change is analyzed and translated into a switching signal.

**Advantages**
- Tried and tested in operation, robust and safe
- Simple commissioning
- Versatile
- Reliable function independent of build-up

**Conductive**

The resistance between two measuring electrodes changes by the presence or absence of a medium. In single-rod probes, the electrically conductive tank wall serves as a counter electrode.

**Advantages**
- Multipoint detection with one process connection
- Simple instrumentation

**Float switch**

As the switch floats up and down on the surface of a liquid, an installed sensor detects its position and triggers the switching operation.

**Radiometry**

The radiometric measuring principle is based on the fact that gamma radiation is attenuated when it penetrates a medium. The radiation source is installed in a source container, which allows the radiation to be emitted only in the direction of the process vessel. The detector is positioned on the opposite side of the process vessel. It converts the received radiation into an electrical signal and uses it to calculate the level.

**Advantages**
- Non-contact measurement from outside
- Made for extreme measuring tasks where other principles can not be used

**Advantages**
- Favourable measuring principle
- Also for Ex area applications
Vibronic – the Liquiphant

The instruments of the Liquiphant family reliably monitor the point level of all pumpable liquids in tanks and pipes. There are numerous applications from simple operational point level detection (minimum and maximum control), certified leakage monitoring and overfill prevention through to protective equipment in plant parts subject to Safety Integrity Levels (SIL2/3).

Liquiphant FTL31
Point level switch in compact design with stainless steel housing
- Temperature: -40 to +150°C (-40 to +302°F)
- Pressure: -1 to +40bar (-14.5 to +580psi)
- Surface roughness: 3.2µm

Liquiphant FTL33
Point level switch in compact hygienic design with stainless steel housing for the food industry
- Temperature: -40 to +150°C (-40 to +302°F)
- Pressure: -1 to +40bar (-14.5 to +580psi)
- Surface roughness: 0.76µm or 1.5µm

Liquiphant FTL51B
Point level switch for liquids in the process industry
- Temperature: -50 to +150°C (-58 to +302°F)
- Pressure: -1 to +100bar (-14.5 to +1,450psi)
- Sensor length: up to 12m (39ft)

Liquiphant FTI52
For liquids that are highly viscous and tend to form build-up
- Temperature: -80 to +200°C (-112 to +392°F)
- Pressure: Vacuum to +100bar (vacuum to +1,450psi)
- Sensor length: up to 6m (20ft)

Liquiphant FTL14B
Point level switch for liquids in utilities across all industries
- Temperature: -40 to +150°C (-40 to +302°F)
- Pressure: -1 to +40bar (-14.5 to +580psi)

Liquiphant FTL64
Point level switch for liquids in high-temperature applications
- Temperature: -60 to +280°C (-76 to +540°F); 300°C (572°F), 50 h on cumulative basis
- Pressure: -1 to +100bar (-14.5 to +1,450psi)

Liquipoint FTW33
Compact, flush-mounted probe
- Temperature: -20 to +100°C (-4 to +212°F), CIP/SIP to +150°C (+302°F) for 1h
- Pressure: -1 to 25 bar (-14.5 to 362.5psi)
- Sensor length: flush-mounted

Liquipoint FTW21
Compact probe for operation in water base media
- Temperature: -20°C to +100°C (+4 to +212°F), CIP/SIP to +155°C (+321°F) for 1h
- Pressure: -1 to 16bar (-14.5 to +232psi)

Advantages at a glance
- Universal use – unaffected by medium properties such as conductivity, dielectric constant, viscosity, pressure and temperature
- Free of calibration and maintenance
- Functional safety SIL2/3
- Accurate switch-point
- Highest reliability due to self-monitoring

Advantages at a glance
- Proved technology
- Universally adaptable probes
- Reliable performance also in viscous media or heavy build-up

Capacitance – the Liquicap, the Liquipoint

Capacitance level measurement covers a wide range of applications. Simple and cost-effective probes offer many possibilities for point level detection in liquids. This measuring principle is particularly suited to applications involving aggressive media and heavy build-up.

Liquicap FTI51
For liquids that are highly viscous and tend to form build-up
- Temperature: -80 to +200°C (-112 to +392°F)
- Pressure: Vacuum to +100bar (vacuum to +1,450psi)
- Sensor length: up to 6m (20ft)

Liquipoint FTW33
Compact, flush-mounted probe
- Temperature: -20 to +100°C (-4 to +212°F), CIP/SIP to +150°C (+302°F) for 1h
- Pressure: -1 to 25 bar (-14.5 to 362.5psi)
- Sensor length: flush-mounted
Conductive – the Liquipoint

The conductive measuring principle offers the possibility for simple, safe detection of a point level in conductive liquids. The measuring principle performs well for a wide range of applications, from secure inventories (minimum quantity) and the avoidance of tank overflow through to two-point and multi-point control (pump control).

Float switch – the Liquifloat

This measuring principle is a simple and cost-effective procedure for point level detection in liquids. It is predominantly used as a level alarm in open basins, e.g. in sewerage treatment plants.

The Liquipoint portfolio for applications in liquids

- **Liquipoint FTW32**
  - Rope probe for multi-point detection up to 5 switch points
  - Temperature: -40 to +100°C (-40 to +212°F)
  - Pressure: -1 to +10 bar (-14.5 to +145 psi)
  - Sensor length: +0.25 to +15 m (+10 to +590")

- **Liquipoint FTW33**
  - Very compact flush-mounted probe
  - Temperature: -20 to +100°C (-4 to +212°F), CIP/SIP to +150°C (+302°F) for 1h
  - Pressure: -1 to +25 bar (-14.5 to +362.5 psi)

- **Liquipoint FTW31**
  - Rod probe for multi-point detection up to 5 switch points
  - Temperature: -40 to +100°C (-40 to +212°F)
  - Pressure: -1 to +10 bar (-14.5 to +145 psi)
  - Sensor length: +0.1 to +4 m (+3.9 to +157")

The Liquifloat for applications in liquids

- **Liquifloat FTS20**
  - For point level detection in liquids
  - Temperature: -20 to +85°C (-4 to +185°F)
  - Pressure: up to +3 bar (up to +43.5 psi)

Advantages at a glance

- Simple measuring principle
- Multi-point detection with one process connection

Advantages at a glance

- Simple measuring principle
- Also for Ex area applications
Gamma instruments are used increasingly in applications where other measuring principles are no longer effective due to extreme process conditions or mechanical, geometric or structural conditions. Radiometric instruments work without contact with the process. They are installed externally on the tank or pipe and measure through the vessel wall. This measurement method is therefore suitable for use in a wide range of media, regardless of the medium properties.

Advantages at a glance

- Non-contact, external measurement for the highest degree of safety and reliability under the most extreme process conditions
- 2-wire loop-powered compact transmitter
- Functional safety up to SIL2/3 according to IEC 61508
Point level detection in bulk solids
Choose the measuring principle which fits best for your application.

Vibronic
A one-rod sensor or a tuning fork is excited at its resonant frequency. The drive works piezoelectrically. The amplitude changes as the fork enters the medium. The change is analyzed and translated into a switching signal.

Advantages
- Universal point level switch
- Largest variety of certificates, housings, electronic inserts, process connections and sensor geometries
- Easy installation
- No wear and tear / maintenance-free

Microwave barrier
Microwave barrier: Detection of all kinds of bulk solids is based on microwaves (transmitter-receiver principle).

Advantages
- Non-invasive in tanks penetrated by microwaves from outside
- Direct assembly with threaded connection
- May also be used as a counter for individual items
- Measuring principle almost unaffected by process conditions (e.g. pressure, temperature, aggressive and abrasive media, dust, contamination build-up)

Capacitance
A capacitance probe may be compared to an electric capacitor. As the tank is filled, the probe capacity increases. This change is electrically analyzed.

Advantages
- Tried and tested in operation, robust and safe
- Easy commissioning
- Versatile

Radiometry
The radiometric measuring principle is based on the fact that gamma radiation is attenuated when it penetrates a medium. The radiation source is installed in a source container, which allows the radiation to be emitted only in the direction of the process vessel.

Advantages
- Non-contact measurement from outside
- Made for extreme measuring tasks where other principles can not be used

Paddle
The rotation of the paddle is stopped as it is covered by solids. This actsuates a relay.

Advantages
- Measuring principle for simple applications
- Calibration not required
- Rotation monitoring
Vibronic – the Soliphant

The Soliphant portfolio for applications in bulk solids

Soliphant FTM20
- Compact vibration point level switch for bulk solids
  - Temperature: -40 to +150°C (-40 to +302°F)
  - Pressure: -1 to +40bar (-14.5 to +580psi)
  - Sensor length: up to 225mm (9”)

Soliphant FTM21
- Vibration point level switch for bulk solids
  - Temperature: -40 to +150°C (-40 to +302°F)
  - Pressure: -1 to +72bar (-14.5 to +1030psi)
  - Sensor length: 150mm (6”)

Soliphant FTM40
- Universal point level switch for fine-grained bulk solids also for explosion-hazardous areas
  - Temperature: -50 to +280°C (-58 to +540°F)
  - Pressure: -1 to +25bar (-14.5 to +360psi)
  - Sensor length: 145mm (5.7”), 200mm (8”)

Advantages at a glance
- Universal use – independent of the medium
- Easy, fast commissioning (no calibration required)
- Permanent self-monitoring
- Build-up and abrasion monitoring

Capacitance – the Nivector, the Minicap, the Solicap

Capacitance level measurement covers a wide range of applications which are not limited to process engineering. Simple and cost-effective probes offer many possibilities for point level detection in liquids and bulk solids. This measuring principle is particularly suited to applications involving aggressive media and heavy build-up.

The Nivector, Minicap and Solicap portfolio for applications in bulk solids

Nivector FTI26
- For all types of powdered and fine-grained solids
  - Temperature: -20 to +180°C (-4 to +356°F)
  - Pressure: -1 to +16bar (-14.5 to +230psi)
  - Sensor length: 140mm (5.51”)

Minicap FTC260
- Point level switch for light bulk solids
  - Temperature: -40 to +130°C (-40 to +266°F)
  - Pressure: Vacuum to +25bar (vacuum to +360psi)
  - Sensor length: 140mm (5.51”)

Minicap FTC262
- Designed for light bulk solids
  - Temperature: -40 to +80°C (-40 to +176°F)
  - Pressure: -1 to +6bar (-14.5 to +90psi)
  - Sensor length: 500 to 6,000mm (20 to 236”)

Solicap FTC50
- Universal point level switch for fine-grained bulk solids also for explosion-hazardous areas
  - Temperature: -50 to +400°C (-58 to +752°F)
  - Pressure: -1 to +10bar (-14.5 to +145psi)
  - Sensor length: 200 to 20,000mm (4 to 666”)

Solicap FTC51
- Universal point level switch for fine-grained bulk solids also for explosion-hazardous areas
  - Temperature: -50 to +280°C (-58 to +540°F)
  - Pressure: Vacuum to 25bar (vacuum to 360psi)
  - Sensor length: 300 to 4,000mm (12 to 157”), 6,000mm (230”) on request

Solicap FTC52
- Universal point level switch for fine-grained bulk solids also for explosion-hazardous areas
  - Temperature: -40 to +80°C (-40 to +176°F)
  - Pressure: -1 to +2bar (-14.5 to +30psi), +6bar (+80psi) for EExd/EExde
  - Sensor length: 750 to 20,000mm (30 to 800”)

Advantages at a glance
- Proved technology
- Universally adaptable probes
- Reliable performance also in viscous media or heavy build-up
Paddle switch – the Soliswitch

The universally usable paddle point level switch is employed as a full, empty and requirement alarm in silos with bulk solids. It is ideal for flowing bulk solids up to a grain size of 50mm (2”).

Soliswitch FTE20
Simple mechanical mechanism, extremely robust and cost-effective point level switch for bulk solids
- Temperature: -20 to +80°C (-4 to +170°F)
- Pressure: +0.5 to +1.8bar (+7 to +25psi)
- Sensor length: Different standard lengths between 75mm (3”) and 300mm (12”), rope length of 2,000mm (80”) (can be shortened)

Soliswitch FTE30
Simple mechanical mechanism, extremely robust and cost-effective point level switch for bulk solids
- Temperature: -20 to +80°C (-4 to +170°F)
- Pressure: +0.5 to +1.8bar (+7 to +25psi)
- Sensor length: Different standard lengths between 100mm (4”) and 800mm (32”), rope length of 2,000mm (80”) (can be shortened)

Soliswitch FTE31
Simple mechanical mechanism, extremely robust and cost-effective point level switch for bulk solids
- Temperature: -20 to +80°C (-4 to +170°F)
- Pressure: +0.5 to +1.8bar (+7 to +25psi)
- Sensor length: Different standard lengths between 100mm (4”) and 600mm (24”), rope length of 2,000mm (80”) (can be shortened)

Microwave barrier – the Soliwave

In many cases where contact methods are limited, microwave barriers are the appropriate solution. They avoid jamming, indicate point levels, solve positioning and counting tasks, provide non-contact measurement and are thus, free of wear and tear. Typical products to be measured are wood chips, paper and carton chips, lime, pebbles, sand or even bags and complete boxes.

Soliwave FDR57
Transceiver for non-contact point level detection in bulk solids
- Temperature: -40 to +70°C (-40 to +158°F); optional +450°C (+842°F)
- Pressure: +0.5 to +6.8bar abs (+7.3 to +98.6psi); optional +21bar abs (+304.6psi)
- Measuring range: up to 100m (328ft)

Soliwave FQR57
Transmitter for non-contact point level detection in bulk solids
- Temperature: -40 to +70°C (-40 to +158°F); optional +450°C (+842°F)
- Pressure: +0.5 to +6.8bar abs (+7.3 to +98.6psi)
- Measuring range: up to 100m (328ft)

Advantages at a glance
- Easy installation
- Recognition of failures without dismantling the instrument
- Robust plastic housing with transparent cover
- Cover securing device
- Density setting without any tools
- Automatic rotation monitoring (optional)

Software FDR15
Transceiver for non-contact point level detection in bulk solids
- Temperature: -40 to +70°C (-40 to +158°F); optional +450°C (+842°F)
- Pressure: +0.5 to +6.8bar abs (+7.3 to +98.6psi)
- Measuring range: up to 20m (66ft)

Software FQR15
Transmitter for non-contact point level detection in bulk solids
- Temperature: -40 to +70°C (-40 to +158°F); optional +450°C (+842°F)
- Pressure: +0.5 to +6.8bar abs (+7.3 to +98.6psi)
- Measuring range: up to 20m (66ft)

Software FQR56
Transmitter for non-contact point level detection in bulk solids
- Temperature: -40 to +70°C (-40 to +158°F); optional +450°C (+842°F)
- Pressure: +0.5 to +6.8bar abs (+7.3 to +98.6psi)
- Measuring range: up to 100m (328ft)

Software FDR16
Transceiver for non-contact point level detection in bulk solids
- Temperature: -40 to +70°C (-40 to +158°F); optional +450°C (+842°F)
- Pressure: +0.5 to +6.8bar abs (+7.3 to +98.6psi)
- Measuring range: up to 20m (66ft)

Advantages at a glance
- Adjustable sensitivity
- Non-contact measurement
- No wear and tear or maintenance with long service life
- Easy installation and commissioning
- Indication of the signal strength
- Automatical adjustment function
- On-site display and simulation
Radiometry – the Gammapilot

Gamma instruments are used increasingly in applications where other measuring principles are no longer effective due to extreme process conditions or mechanical, geometric or structural conditions. Radiometric instruments work without contact with the process. They are installed externally on the tank or pipe and measure through the vessel wall. This measurement method is therefore suitable for use in a wide range of media, regardless of the medium properties.

Advantages at a glance

- Non-contact, external measurement for the highest degree of safety and reliability under the most extreme process conditions
- 2-wire loop-powered compact transmitter
- Functional safety up to SIL2/3 according to IEC 61508
# Density / Concentration

Density measurement for quality monitoring and process control

## Advantages

- Large number of process connection to choose from: universal usage
- Inletable in hygienic applications
- Calculation of customer specific units e.g. °Brix, °Plato, °Baumé etc. possible
- Up to 5 Liquiphant Density sensors can be connected to the density computer FML621

## Installation options

- Direct measurement in tanks and pipes
- Direct measurement in the pipe
- From outside through the pipe, in the bypass or tank
- Direct measurement in tanks
- Direct measurement in the pipe
- Direct measurement in the, in the bypass or tank
- Direct measurement in the, in the bypass or tank

## Process pressure

- Up to 25 bar/363 psi
- Up to 400 bar/5,800 psi
- Independent
- Independent
- Independent
- Independent

## Norm density, °Brix, °Baumé, °API

- 0.002 g/cm³
- 0.0005 g/cm³
- ±0.001 g/cm³
- 0.003 g/cm³
- g/cm³, g/l, lb/gal, concentration
- g/cm³, g/l, kg/l, kg/dm³, kg/m³, lb/ft³, lb/gal (us), lb/in³, STon/yd³, °API, SGU

## Units of density

- Standard density, standard volume flow and totalizing, % mass, % volume, alcohol tables (for mass and volume), target flow and carrier flow, °Brix, °Plato, °Baumé, °API, etc.
- g/cm³, g/l, lb/gal, concentration
- g/m³, g/ml, g/l, kg/dm³, kg/m³, lb/ft³, lb/gal (us), lb/in³, STon/yd³, °API, SGU
- g/m³, g/ml, g/l, kg/dm³, kg/m³, lb/ft³, lb/gal (us), lb/in³, STon/yd³, °API, SGU

## Output/communication

- 4 to 20mA, relay, Ethernet, PROFIBUS Profibus
- 4 to 20mA HART, PROFIBUS PA/DP, FOUNDATION fieldbus, MODBUS
- 4 to 20mA
- 4 to 20mA

## Approvals

- ATEX, FM, CSA, IECEx, TÜV, NEPSI, 3-A, EHEDG, CRN, FDA
- ATEX, FM, CSA, TÜV, SIL2, 3-A, EHEDG, IECEx
- ATEX, FM, CSA, IECEx, NEPSI, SIL, WHG, TÜV
- For custody transfer applications: NMi, PTB, METAS, BEV...

## Additional information

- Connect of temperature- and pressure transmitter for compensation
- Approvals for applications in custody transfer (PTB, NMI, EAM/METAS, BEV)
- Approvals for applications in custody transfer (PTB, NMI, EAM/METAS, BEV)
- Additional volume flow measurement enables mass flow calculation

## Application limits

- Gas bubbles or build-up at the sensor fork
- Fluid velocity >2m/s in pipes
- Liquids with high viscosity >350 mPa-s
- Not for non-homogeneous mediums
- Only for pipe diameters up to DN 250
- Not with degasification in the medium

## Vibronic – Liquiphant Density

**Quality measurement in liquids**

With an individual developed electronic, the process approved vibronic principle is usable for density measurement. Overriding preliminary, interim and final products, determining the exact density or concentration, monitoring quality and controlling process – all these activities constitute a reason for the density measurement of the medium. Using the vibronic principle, we offer you the possibility of determining density and concentration in a simple and fast manner across industries.

### Advantages at a glance

- Costly laboratory avoid
- Process monitoring and controlling in situ and online
- Complying with tolerances is to increase quality
- Industry independent
- Any unit you require (°Plato, °Brix, °Baumé,...)

### Functional principle

A sensor in form of a tuning fork is excited on its resonance frequency. The drive works piezoelectrically. The oscillating frequency changes in liquids.

Different media has different density/concentration, therefore, we have different oscillating frequencies. Those signals will be evaluated and converted into quality information by Liquiphant Density.
Interface measurement

Separate the best from the rest

Interface measurement for any application

Your application is of prime significance because the instrument serves the application and is only selected once the general setting is known. You get the optimum interface measurement solution in relation to your process requirements from us.

Precise interface measurement is important in continuous and dynamic processes. Is the overall level constant or variable, and if so, in which range? Should the overall level be available as a measured value in addition to the interface measurement? Does emulsion occur during measurement?

Functional principles

- **Guided radar**
  As the pulses impact the medium surface, only part of the sending pulse is reflected. Especially in media with a low dielectric constant (DC), the other part penetrates the medium. As the signal enters the lower medium with a higher dielectric constant it is reflected once more. Taking the delayed Time-of-Flight of the pulse through the upper medium into consideration the distance to the interface is determined in addition.

- **Multiparameter**
  The name of the innovation in interface measurement is FMP55 Multiparameter. This instrument combines the advantages of the capacitance and guided radar measuring principles. Emulsion layers may cause signal losses in interface detection in guided radar measurements. Only Levelflex FMP55 Multiparameter can guarantee safe measured values for both the interface and the overall level with this unique, redundant measuring system.

- **Servo technology**
  The density of the medium can be determined by immersing the displacer in the product. Jumps of 0.1 g/cm³ in the density measurement are interpreted by the sensor as the interface. The sensor can determine up to three interfaces within the tank. This enables it to reliably measure the water level within an oil tank at any time and thus calculate the actual quantity of usable product in the tank.

- **Capacitance**
  Media with a small dielectric constant (DC) cause very small changes of the capacitance value while media with a high DC produce respectively large capacitance changes in level measurement. In many interface applications, the medium with the smaller DC value is on top, e.g. in hydrocarbon on water. The upper medium merely provides a minimum contribution to the overall capacitance value – the issued level thus only refers to the water level (the interface).

- **Radiometry**
  The measurement effect is based on the fact that the different interfaces absorb radiation differently. Once the transmitter is calibrated for the media by means of wet calibration, there is an automatic correlation to the interface measurement.

The answers to such questions have a strong influence on the correct selection of instrumentation. We offer you transparency in relation to options, application limits and commissioning of the individual measuring principles. Guided radar, multiparameter, capacitance instrumentation or radiometry – we support you in your application.
## Interface measurement

The application determines the sensor

<table>
<thead>
<tr>
<th>Measuring task</th>
<th>Measuring principle</th>
<th>Features / advantages</th>
<th>Application limits / conditions</th>
</tr>
</thead>
</table>
| Clear interface liquid / liquid | Guided radar Levelflex FMP51/52/54 | • Simultaneous acquisition of interface layer and total level if clear interface  
• No wet calibration required  
• Not affected by the density of the medium  
• Applications up to +50°C/+400bar (+842°F/+5,800psi)  
• Probes can be shortened (rod/rope) | DC of the upper medium may be max. 10  
DC value changes of the upper medium affect the accuracy  
DC value of the upper medium may be max. 10  
DC value difference between both media must be >10  
For interface layer measurement, the thickness of the upper phase must be minimum 80mm (3.15”)  
| Clear interface liquid / liquid  
• Interface with emulsion layer liquid / liquid | Multiparameter Levelflex FMP55 | • Simultaneous acquisition of interface layer and overall level, also in case of emulsions  
• Independent of medium density  
• Wet calibration not required  
• Applications up to +200°C (+392°F)  
• PTFE-coated probe | Product density 0.430 to 2.000g/cm³  
27 to 125lg/ft³  
 Interfaces greater than 0.1g/cm³  
6.24lb/ft³  |
| Clear interface liquid / liquid  
• Interface with emulsion layer liquid / liquid | Servo technology Proservo NMS80/81/83 | • Trouble-free operation in the case of emulsion layers  
• Can be used from -200 to +200°C  
(-328 to +392°F)  
• Variable measuring range up to 55m (180ft); longer on request  
• Density profile measurement of multi-phase layers with up to 50 density point across measuring distance  
• Tank bottom or datum plate measurement for monitoring the reference height of the sensor | Difference of the dielectric constant (DC) between the two media must be >10  
The upper medium may not be conductive  
Accuracy impairment in case of nonconductive build-up on the probe  
The smaller the vessel the higher the influence of DC changes in the upper medium  
The total level is not measured  
| Clear interface liquid / liquid  
• Interface with emulsion layer liquid / liquid | Capacitance Liquicap FMI51/52 | • Tried and tested instrumentation  
• No wet calibration required  
• Not affected by the density of the medium  
• Unproblematic use in emulsion layers  
• Ideal for very small measuring ranges  
• Applications up to +200°C/+100bar (+392°F/+1,450psi)  
• The overall level can be measured by using an additional radiation source and detector  
• Calibration with media necessary | The upper medium may not be conductive  
Accuracy impairment in case of nonconductive build-up on the probe  
The smaller the vessel the higher the influence of DC changes in the upper medium  
The total level is not measured  |
| Clear interface liquid / liquid  
• Interface liquid / solid  
• Multilayer liquid / solid | Radiometry Gammapilot FMG50, Source container FQG62 | • Non-invasive and maintenance-free measuring method  
• Unaffected by pressure and temperature  
• Only slight influence by build-up  
• Unproblematic use in emulsion layers  
• Continuous density profile measurement for multilayer using a multideceltor solution | Difference of the dielectric constant (DC) between the two media must be >10  
The upper medium may not be conductive  
Accuracy impairment in case of nonconductive build-up on the probe  
The smaller the vessel the higher the influence of DC changes in the upper medium  
The total level is not measured  |
## Smooth integration into your control system – thanks to digital communication

We offer all common electronic communication protocols. In addition to the classic analog electronics (output 4 to 20mA) digital electronic inserts are also available.

- **FOUNDATION fieldbus** offers easy testing of instruments, important additional information and diagnostic functionalities according to NAMUR NE107 as well as smooth system integration which increases the availability and safety of your plant.
- **HART electronics** (output 4 to 20mA with superimposed HART protocol) for additional functionalities and diagnostic functions.
- **PROFIBUS PA electronics** for the complete integration into digital industrial bus systems. Simplified instrument identification, brief uploading and downloading times during commissioning, diagnostic functionalities according to NAMUR NE107 and the smooth integration help to reduce costs and downtimes to a minimum.
- **Ethernet-APL with PROFINET** combines benefits of simple and robust 2-wire technology with benefits of Ethernet, enabling top-performance and seamless data access in the field of process plants.

All digital electronics may be smoothly integrated into different control systems and can be configured via a PC and the universal FieldCare/DeviceCare operating program as well as via all common PAM systems.

### Diagnostic categories

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Status Text</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>✗</td>
<td>Failure</td>
<td>The output signal is invalid due to a functional failure in the field instrument or its periphery.</td>
</tr>
<tr>
<td>⬆️</td>
<td>Function control</td>
<td>Work is performed on the field instrument, the output signal is thus temporarily invalid (e.g. frozen).</td>
</tr>
<tr>
<td>🔴</td>
<td>Maintenance</td>
<td>The output signal is still valid but the wear and tear reserve will be depleted soon or a function will be limited shortly due to the conditions of use, e.g. ageing of the pH electrode.</td>
</tr>
<tr>
<td>🔴</td>
<td>Non-conformance to specification</td>
<td>Deviations from the permitted ambient or process conditions determined by the instrument through self-monitoring or failures in the instrument itself show that the uncertainty of measurement in sensors or set point deviation in actuators probably exceeds what is expected under operational conditions.</td>
</tr>
</tbody>
</table>

### Operating cost savings due to instrument diagnosis

Plant asset management is one of the most important trends in process industry. Thanks to digital communication protocols, all current Endress+Hauser instruments support the diagnostic categories according to NAMUR NE107. The pertaining classification of failures into four categories ensures that the right information is transmitted to the right persons at the right time. This avoids operating failures, improves the maintenance cycle and finally reduces costs.

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In our System World (integration test lab), the integration capabilities of the devices is tested, thus ensuring system independence. We also offer training specifically for the integration of the devices into the respective control systems - and basic training on digital communication technologies used in process automation. Events and Trainings | Endress+Hauser

- **Build-up on the sensor** is detected by the analysis of the “Relative Echo Amplitude” (predictive maintenance). Maintenance cycles can thus be planned in a significantly improved manner. In the same way, foam formation is detected in the process which, in turn, permits conclusions concerning the quality of the process or medium (process diagnosis).
- The supply voltage can be continually recorded and monitored during the verification of the field instrument installation. This, in turn, permits valuable conclusions concerning clamp corrosion and ensures the uninterrupted operation of the instrument (predictive maintenance).
Netilion – the multi-brand ecosystem

Netilion is a cloud-based IIoT ecosystem, designed for industrial processes. It connects the physical and digital worlds to send valuable information from the field straight to your phone, tablet or other devices. Netilion empowers you to improve efficiency and drive innovation.

Multi-brand ecosystem
You have equipment from various vendors in your installation. An IIoT solution should provide data from as many assets as possible, and Netilion can do that. This multi-brand ecosystem brings transparency into a plant regardless of device type or manufacturer.

Security and privacy
Your facility’s information is valuable and needs protection. Netilion allows users to access data digitally because it meets internationally recognized standards of cloud-platform security. It’s a safe harbor for your data.

Decentralized processes monitored efficiently
- Reduction of routine checkup tours through comprehensive visualization of essential process variables, e.g. flow quantities, limit values, levels, temperature, pressure or physicochemical quality parameters
- Low operating costs through fast reaction in case of failure

Legal compliance thanks to automation
- Continuous measurement of quantitative and qualitative parameters
- Generation of legally compliant documentation thanks to integrated reporting systems

Data access around the clock
- Complete data access independent of time and place
- Numerous options to analyze and visualize ratios, amounts, thresholds, time series and trends, as well as balances
- Everything at a glance thanks to the web-based visualization of networks with optimized depiction for highly diverse terminal devices

More about Netilion:
www.netilion.endress.com

5. Data fusion and analysis
Algorithms for leakage detection, verification, forecasts, etc.

4. Data management and visualization
Monitoring of networks and decentralized infrastructures

3. Data collection and transmission
Flexible edge connectivity solutions

2. Data collection and control
Smart field devices and sensors (flow, analysis, pressure, level, temperature, etc.)

1. Physical world
Infrastructure (pipes, pumps, valves, etc.)
Test Center

There are some things you can never get enough of – for example, safety

Our Test Center (internationally accredited test centre: FM, CSA) has three laboratories for device safety, application technology and electromagnetic compatibility. The various test units make it possible to ensure and improve the reliability and quality of our devices under realistic test conditions. In addition, the devices for new applications can be tested in advance during development.

In the various ‘durability tests’, devices are exposed to extreme conditions as can be expected in real applications. These include dust tests (explosion protection), abrasion and friction tests, climate tests (heat and cold), mechanical load tests and spray water leak tests. A fully automated tank test plant with a capacity of 24,000 liter, is used to simulate the most difficult applications. The Test Center also has an accredited EAC laboratory.

Apart from carrying out tests on our devices during development, the Test Center also trains service staff and even customers. Customer specific application problems are analyzed, tests to simulate new applications are run and device approvals are carried out.
Process automation enterprises reduce inventory costs and increase their productivity by comprehensive inventory display around the clock.

How much raw material is available on site? Is it sufficient to produce incoming orders or is reordering required? How much storage space is still available? These are typical questions when processing, transporting and storing products like chemicals, crude oil or petrol. Monitoring and controlling the flow of materials constitutes a genuine challenge for companies of the most varied industries. The key for efficient inventory management is a comprehensive and precise chain of information from the field right through to the management level. Being an expert in level measurement, we offer the right measuring principle for any application from our complete instrumentation range. However, in inventory management solutions we take another step ahead: Software and gateways generate relevant information from data to facilitate decisions on basis of current values at any time and to optimize processes continually. The solutions are scalable in many ways: From mere monitoring of tanks and silos through to the highly accurate measurement of tank levels for custody transfer.

Custody transfer solutions for tank farms and terminals
Today, customers as well as the legislator place far-reaching requirements on the operator of a tank farm or terminal. The focus is on safety aspects, transparency of inventories and meeting custom-law regulations in custody transfer logistics. Our highly accurate tank gauging instruments of the latest generation, Proservo and Micropilot, meet these requirements. The exact measurement (with an accuracy up to ±0.4mm) and the compliance with functional safety (SIL2/3) are setting standards in the market today. The modern inventory management solutions of Endress+Hauser aim at using the level data to increase efficiency. They consist of instruments, wireless, mobile radio or Ethernet gateways and the smart inventory management software called SupplyCare. It collects data automatically, makes it available in a consolidated form and visualizes it in a manner oriented to users or requirements. At the same time, it is completely modular and scalable according to applications.

SupplyCare links all production and storage sites and guarantees the comprehensive visibility of your entire inventory – around the clock and around the globe. The advantages are obvious: You optimize and reduce your inventories and tie down only as much capital as required and your material is available whenever you need it. All parties involved in the supply chain of your enterprise, from purchasing and production through to shipping, have access to the system at any time. Of course, also via mobile terminals. If a limit is surpassed or undercut, the system automatically informs the relevant persons. This function helps recognizing the optimum time for reordering. SupplyCare links the entire supply chain, from your supplier to your customer. Our vendor managed inventory system triggers a purchase order at the supplier’s premises automatically, as soon as your inventory is not sufficient anymore. At the same time, the system informs your customers on required shipments. You virtually supply automatically and just-in-time. Your customer does not have to tend to anything. From simple monitoring and visualizing of tanks and silos through to complex supply chain systems on a global level, the solutions guarantee complete transparency for your success.

Inventory monitoring in producing enterprises
Wherever materials are produced or distributed, tanks or silos are involved. They store raw materials, semi-finished products or finished products to be sold. Inventories are continually acquired to ensure efficient production without any downtime. The modern inventory management solutions of Endress+Hauser aim at using the level data to increase efficiency. They consist of instruments, wireless, mobile radio or Ethernet gateways and the smart inventory management software called SupplyCare. It collects data automatically, makes it available in a consolidated form and visualizes it in a manner oriented to users or requirements. At the same time, it is completely modular and scalable according to applications.

SupplyCare links all production and storage sites and guarantees the comprehensive visibility of your entire inventory – around the clock and around the globe. The advantages are obvious: You optimize and reduce your inventories and tie down only as much capital as required and your material is available whenever you need it. All parties involved in the supply chain of your enterprise, from purchasing and production through to shipping, have access to the system at any time. Of course, also via mobile terminals. If a limit is surpassed or undercut, the system automatically informs the relevant persons. This function helps recognizing the optimum time for reordering. SupplyCare links the entire supply chain, from your supplier to your customer. Our vendor managed inventory system triggers a purchase order at the supplier’s premises automatically, as soon as your inventory is not sufficient anymore. At the same time, the system informs your customers on required shipments. You virtually supply automatically and just-in-time. Your customer does not have to tend to anything. From simple monitoring and visualizing of tanks and silos through to complex supply chain systems on a global level, the solutions guarantee complete transparency for your success.

Inventory Management Solutions
Inventory management is much more than level measurement

Our inventory management solutions support you:

- Highest degree of transparency in recording product gains and losses by reconciling the inventory with additions and disposals in the plant.
- Increase in customer satisfaction by higher delivery reliability and the elimination of products out of stock and emergency shipments.
- Fast and efficient reaction to supply chain fluctuations due to company supply and value added chain optimization.
- Lower inventory management costs due to the integration of data in your system thus facilitating the fast and effective data exchange with your business partners and systems.
- Increase in productivity due to higher accuracy of your inventory monitoring and improved planning resources.
Inventory Management Solutions

- Endress+Hauser Portal
- SupplyCare
- ERP
- Tankvision
- PowerModem
- MicroSD
- SIM
- Antenna
- Ethernet
- Fieldgate FXA42
- Micropilot FMR30
- Micropilot FMR51
- Micropilot FMR52
- Micropilot FMR532
- Micropilot FMR540
- Prothermo NMT539
- Micropilot NMR81
- Micropilot NMR84
- Tank Side Monitor NRF81
- Tank Gauging Terminal Management
- Terminal Vision NX85
- ERP
- Inventory Control
- Tank Gauging
- Terminal Management
Tools for selection and operation

Endress+Hauser Applicator
Our Applicator software is a convenient selection and sizing tool for planning processes. Using the entered application parameters, e.g. from measuring point specifications, Applicator determines a selection of suitable products and solutions. Supplemented by sizing functions and a module for project administration Applicator will alleviate your daily engineering work.

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Endress+Hauser Operations App
The app offers fast access to up-to-date product information and device details e.g. order code, availability, spare parts, successor products for old devices and general product information - wherever you are, whenever you need it.

Simply enter the serial number or scan the data matrix code on the device to download the information.

Endress+Hauser SmartBlue-App
- Time saving mobile access to device, diagnostics and process information even in hazardous areas
- Secure data transmission for fast and reliable configuration and maintenance, reviewed by Fraunhofer Institute

Endress+Hauser DC App
The app offers comfortable access to several thousand DC values for all kinds of different media. You can search by the name of the medium or the chemical formula. The autocomplete functionality helps you if you don’t know the exact spelling of the name of your medium.

Services - by your side
Committed to your business, for improved plant performance

Our commitment to you is to support, to service and to optimize your process. Whatever your location or your industry, our global service force of over 1000 experts is strategically located worldwide ensuring active local presence to help you reach your goals. Based on our process knowledge and technical expertise, a uniform approach through clear procedures ensures that the work we conduct for you is done properly. Customized responses can also be adapted to your needs, contact us today.

Supporting
Need quick response to support you in emergency situations? We are near you – ready and willing to provide you with the appropriate support
- Diagnostic and repair
- Support services

Servicing
Looking for expertise? We offer a variety of services to complement the capabilities of your staff throughout your plant lifecycle
- Calibration services
- Commissioning services
- Maintenance services
- Training and seminars
- Engineering services

Optimizing
Need help to reduce costs while maintaining compliance? We offer effective ways to optimize your processes, enabling you to increase productivity and reach your business goals
- Maintenance optimization

All Apps are available for Apple and Android devices

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