Level measurement

Point level detection and continuous level measurement in liquids and bulk solids

Look for our link emblem inside to access more information about Endress+Hauser and our products
Endress+Hauser – from a supplier of instrumentation to a provider of complete systems

What is Endress+Hauser’s complete product offering? Many of our customers ask this question. After all, our competence in products, solutions and services is not always appreciated. We have developed from a supplier of instrumentation, to a provider of complete systems with the goal of serving our customers throughout the entire life-cycle of their plants and help increase their industrial productivity. We have arranged our activities in accordance with core processes: development, production and delivery of quality products, solutions and services. Wherever level, pressure, flow, temperature, analytical and recording data is needed and systems, components and solutions are used, many companies appreciate the experience of Endress+Hauser. This is one of the reasons why we are a leading global provider of measurement, control and automation solutions for process industry production and logistics.

Curious? Visit us at www.us.endress.com

We are a family enterprise with a staff of more than 8,500 world-wide and sales of more than $1.9 billion in 2010. Our global presence with production sites (Product Centers) in Europe, Asia and the US, as well as sales and service organizations in almost all countries of the world, ensures constant communication with our customers. This enables Endress+Hauser to consistently support the competitiveness of our customers with the highest degree of quality, safety and efficiency.

Continuous optimization of our processes and the use of innovative state-of-the-art technology enable us to extend the frontiers of measurement, control and automation engineering and to find safe and efficient solutions for the benefit of our customers. We ensure the compatibility of our processes with the environment to save energy and resources.

All this makes our customers confident that they will also be able to rely on us in the future as “People for Process Automation!”
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Continuous level measurement of bulk solids and liquids, safe level limit detection and pressure measurement in tanks and pipes constitute central tasks of process engineering.

The production facility located in Greenwood, Indiana utilizes state-of-the-art production techniques and manufacturing technologies to ensure the quality of the instrumentation produced, as well as the safety of employees and the environment. Continuous investments in the design and development of computer driven test and assembly equipment allows for quality validation directly in the work cell, while maintaining rapid delivery. The field instrumentation produced is subject to tough application and environmental conditions, from extreme temperature fluctuations and exposure to hazardous environments, to mechanical stresses. The Endress+Hauser production meets the challenge of these demanding requirements as attested to by our installed base of over six million level measuring points worldwide.

**Level and pressure instrumentation**

Endress+Hauser offers instrumentation for the measurement of level limits and continuous levels in liquids and bulk solids using eight measurement principles with 11 different product families. Also measurable is pressure, absolute pressure and differential pressure by ceramic-capacitive or piezo-resistive sensors.

**Real solutions**

Wherever material is transported and stored, high-performance and precise inventory management is the key to smooth production. Endress+Hauser leads the way with the development of sophisticated inventory control systems which assume part of real-time logistic process control.

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**Milestones in level measurement**

- **1953** Foundation of the company with capacitive probes for level measurement
- **1962** First radiometric measuring line
- **1968** Soliphant – first vibronic limit switch for bulk solids
- **1969** First sonic sensor for continuous level measurement
- **1983** Liquiphant – first vibronic limit switch for liquids
- **1993** Micropilot – first level radar for non-contact measurement
- **1998** Levelflex – first guided level radar for the present world market leader
- **2002** Fieldgate – worldwide remote inquiry, diagnosis and configuration of sensors
- **2004** Guided level radar for 750°F (400°C) and 5,800 psi (400 bar)
- **2005** Micropilot – level radar for bulk solids
- **2008** Liquiphant – vibration limit switch for density measurement
- **2009** Gammapilot M – gamma level measurement technology released for use in the US market
Constant product quality, plant safety and economic efficiency are all important aspects for any level measuring point. Levels of liquids, pastes, bulk solids or liquefied gases are often measured in tanks, silos or movable containers. From the chemical, petrochemical and energy industries to the pharmaceutical, food and environmental industries, applications range from -330°F to 1,472°F (-200°C to 800°C) and from -15 psi to 7,250 psi (-1 bar to 500 bar).

Finding the ideal solution is easy with the broad range of measuring principles available from Endress+Hauser. No principle is suited for all areas of application, therefore, measuring systems have to be selected which work reliably under the conditions of a particular application and, at the same time, meet the economic considerations of the future.

As the market leader in level measurement, Endress+Hauser supports you from planning and commissioning, to the maintenance of your measuring point. In addition, we assist you in automation, asset management and visualizing of process data.

**Level instrumentation**
Level limits and levels in liquids and bulk solids use eight measurement principles with 11 different product families.
The right measuring principle for every application

Level measurement applications in liquids, including liquefied gases and bulk solids, are divided into four areas: Continuous measurement, point level detection, density and interface measurement. The overview contains the measuring principles suitable for each area.

**Continuous level measurement**
Continuous level measurement determines the level of media – it actually measures the length. The measuring ranges cover from a few inches for control tasks, typically 6 to 30 ft (2 to 10 m) for liquid applications and up to 230 ft (70 m) in bulk solids such as in grain silos for an example. Apart from direct level measurement in feet, the product volume in a tank may be determined indirectly. The geometric form and dimensions of the tank, as well as medium properties must be taken into consideration for this. Inventory management applications often demand increased accuracy of up to ±1/16 in (±1 mm).

**Point level detection**
The essential tasks are to avoid overfilling or excessive emptying of tanks and to protect pumps from running dry. Fast and safe functioning and high reproducibility are of great importance in point level detection.

**Density/Concentration**
Not level limit, but quality of the media is determined here by known measuring principles. Through data acquisition of density/concentration, other variables can be calculated. Reproducibility and quality are the key words.

**Interface measurement**
Liquid mixtures are in focus here. Clean interfaces, emulsions or complex mixtures, including solids... for each application we find a suitable solution.

<table>
<thead>
<tr>
<th>Continuous level measurement</th>
<th>Point level detection measurement</th>
<th>Density and concentration measurement</th>
<th>Interface measurement</th>
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<tbody>
<tr>
<td>Level radar</td>
<td>Vibronic</td>
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<td>Guided level radar</td>
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<td>Guided level radar</td>
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<td>Coriolis</td>
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<td>Gamma</td>
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<tr>
<td>Ultrasonic</td>
<td>Ultrasonic</td>
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<td>(solids in water)</td>
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<td>Hydrostatic</td>
<td>Gamma</td>
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<tr>
<td>Differential pressure</td>
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<tr>
<td>Gamma</td>
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</table>

<table>
<thead>
<tr>
<th>Liquids</th>
<th>Bulk solids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level radar</td>
<td>Guided level radar</td>
</tr>
<tr>
<td>Guided level radar</td>
<td>Capacitance</td>
</tr>
<tr>
<td>Ultrasonic</td>
<td>Paddle switch</td>
</tr>
<tr>
<td>Electromechanical</td>
<td>Microwave barrier</td>
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<tr>
<td>Gamma</td>
<td>Ultrasonic</td>
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</tbody>
</table>


Time of Flight method

Three measuring principles – one philosophy

Level measurement in the most diverse applications

Radar pulses or ultrasonic waves are emitted by a sender, reflected by the product surface and again detected by a receiver. From the Time of Flight (ToF) of the pulse, the distance between the sender and the surface is determined using the known velocity of propagation. Taking the tank height into consideration, the level can be calculated from this value.

Advantages at a glance
- No mechanical moving parts, leading to low maintenance costs
- High accuracy due to independence of medium properties (for example: density and conductivity)
- No calibration required in changing media

The three Time of Flight principles
Different requirements in continuous level measurement of liquids and bulk solids require special measuring principles. For example, radar technology has established itself in large areas of the chemical industry. New developments extend the range of applications to bulk solids. Guided level radar has its place both in silo applications and in liquid media. Ultrasonics constitute the standard in bulk solids measurement and in the area of water and wastewater treatment. With Micropilot, Levelex and Prosonic, Endress+Hauser offers the optimum solution for many applications.

Micropilot
Non-contact radar level measurement

Levelex
Guided level radar measurement

Prosonic
Ultrasonic radar level measurement
Time of Flight method

Three measuring principles – one operating philosophy

Uniform operation

The uniform operating philosophy of all Endress+Hauser level instruments facilitates fast and easy configuration.

Menu-guided commissioning
The uniform operating standard for Endress+Hauser’s three different Time of Flight measurements has a plain text display to guide you simply and safely through configuration and commissioning. Integrated help text and clear error instructions reduce search times.

Obtaining information on the application (storage, buffer, agitator) and tank geometries the PulseMaster® software sets the required parameter automatically at the instrument.

Plausibility check
The envelope curve representation (echo curve) on the instrument display facilitates fast and safe plausibility checks on-site as well as in hazardous areas. There is no additional equipment required. Even in sophisticated measuring tasks, the software provides input proposals based on the experience of our service technicians.

Communication protocols
Configuration, diagnosis and documentation may be comfortably handled from the control room via the HART® signal. This is superimposed on the current signal (4 – 20 mA) already in standard design. The optional communication protocols of PROFIBUS® and FOUNDATION™ Fieldbus facilitate simple digital integration into visualization and distributed control systems.

Advantages at a glance
- Fast and safe commissioning due to step-by-step menu-guided operation in national languages
- Envelope curve – you see what the instrument sees
- Simple plausibility check on-site
- Comfortable configuration from the control room
Configuration, diagnosis and documentation

From the control room

FieldCare operating software
This software comes free-of-charge with every Time of Flight instrument purchased. It allows remote configuration via your PC and is normally connected via HART® or a digital fieldbus. The Time of Flight software tool offers additional benefits:
- Menu-guided configuration with graphic support and online help
- Simple and safe diagnosis via extensive envelope curve analysis, graphic evaluation assistance and event-driven data recording
- Detailed measuring point documentation

Configuration
With the support of the connection assistant, the connection from the PC to the instrument is established first. The configuration editor then guides you from basic calibration to measuring point optimization. The menu of the software is structured in a similar way to the display but offers context-dependent help text for additional support. Clearly structured diagrams assist in the entry of respective parameters. Of course, all instrument information may be stored (uploaded) and, if required, rewritten into the instrument (downloaded).

Measuring point documentation
ToF operating software generates documentation in PDF format. All of the information, for example, all instrument parameters and the envelope curves are represented. The cover sheet of documentation can be individually designed to include a company logo or a photograph for example. The memory-saving PDF format simplifies electronic archiving.

Diagnosis functions
The graphic representation of the envelope curve and the various analysis functions are an integral part of this ToF software and facilitate easy diagnosis of all aspects of the measuring point. They permit, for example, an assessment of the signal quality and thus of the reliability of measurements, the analysis of process influences or the storage (also time or event-controlled) and retrieval of envelope curves.

Tankmap
Ideal echo curve
Envelope curve

The most important parameters are displayed by the envelope curve
Radar level measurement

Micropilot

Non-contact measurement in liquids and bulk solids

Radar level measurement is a safe solution for liquids under extreme process conditions (pressure, temperature) and vapors. The development of this measuring principle led to its use in bulk solids applications as it is unaffected by dust and noise.

Advantages at a glance
- Non-contact measurement (free of wear and tear) that can be used in extreme process conditions
- Vapors or dusty media do not affect the measurement
- Safe measurement in vessels with changing product
- Reliable measurement due to advanced dynamics signal strength
- Best signal identification by Pulse Master eXact software algorithms

Functional principle
Micropilot uses high-frequency radar pulses which are emitted from an antenna and reflected by the product surface. The Time of Flight $t_0$ of the reflected radar pulses is directly proportional to the path traveled $d$.

$$d = \frac{c \cdot t_0}{2}$$

$c =$ speed of light $186,400$ miles/s ($300,000$ km/s)

Taking the tank geometry into consideration, the level can be calculated from this value.

Measuring frequencies
The frequencies used by radar instruments are approximately 6 and 26 GHz.

26 GHz
- Unaffected by tank baffles due to small beam angles starting at 4°
- High accuracy starting from .12 in (3 mm)

6 GHz
- Low impairment through boiling, turbulent surfaces as well as condensate, build-up or foam
Micropilot M in liquids
2-wire radar level gauge for storage and process applications.
- Different antenna designs, suitable for aggressive media
- Flush fitting for hygiene applications
- Gas-tight feed-through for toxic and aggressive media
- Antistatic rod antenna

Micropilot M in bulk solids
2-wire radar level gauge for powders and bulk solids.
- Parabolic antenna for large measuring ranges up to 230 ft (70 m)
- Integrated purging air connection
- Alignment device for adjustment to product surface
- Metalized plastic antenna for simple solid applications up to 49 ft (15 m)

Micropilot S
Radar level device for precision measurement in inventory management (tank gauging).
- Accuracy ±.04 in (±1 mm) in 130 ft (40 m) measuring range
- Approved for custody transfer
- Numerous national calibration certificates

<table>
<thead>
<tr>
<th>Type</th>
<th>FMR230</th>
<th>FMR231</th>
<th>FMR240</th>
<th>FMR244</th>
<th>FMR245</th>
<th>FMR250</th>
<th>FMR530/S31/S32/S33</th>
<th>FMR540</th>
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<td>m</td>
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<td>m</td>
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<td>bar</td>
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<td>in</td>
<td>mm</td>
<td>in</td>
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<td>131 (optional 229)</td>
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<td>20 (optional 35)</td>
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<td>-14.5 to 580</td>
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<td>-1 to 160</td>
<td>-1 to 40</td>
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<tr>
<td>± .39</td>
<td>± .12</td>
<td>± .59</td>
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<tr>
<td>± 10</td>
<td>± 3</td>
<td>± 15</td>
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<td>4 - 20 mA/HART®, PROFIBUS-PA, FOUNDATION™ Fieldbus</td>
<td>4 - 20 mA/HART®</td>
<td>4 - 20 mA/HART®</td>
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</tr>
</tbody>
</table>
Guided radar level measurement

Levelflex

Measurement in liquids and bulk solids

Guided radar pulse measurement is suited for both bulk solids (cable probes) and liquids (rod and coax probes). 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 in bulk solids do not influence measurement. Reliable measurement is safeguarded in turbulent liquid surfaces or foam formation. Guided radar can also be used for interface measuring.

Advantages at a glance
- Safe measurement in bulk solids and in applications with strong dust formation
- Reliable measurement in liquids with turbulent surfaces and foam formation
- Simple commissioning due to pre-calibrated sensor
- High reliability due to automatic probe monitoring (patented EOP Algorithm)
- Ideally for direct replacement of displacers in existing displacer chambers

Functional principle
Levelflex uses high-frequency radar pulses guided along a probe. The characteristic impedance changes as pulses meet the surface of the medium and part of the transmitted pulses are reflected. The time between transmission and reception of the reflected pulse is measured and analyzed by the instrument which provides a direct value for the distance between the process connection and the medium surface.

Functional principle interface measurement
A part of the radar impulse permeates media with a low dielectric constant (DK). At the interface to a second medium with a higher DK, the pulse is reflected a second time. Taking the delayed time of flight of the pulse through the upper medium into consideration, the distance to the interface layer can now also be determined. Levelflex measures both the total level and the interface level simultaneously and highly accurate.
Levelflex FMP50
For basic applications in liquids; rod and rope version.

Levelflex FMP51
The standard sensor in liquids; rod, rope and coax version.

Levelflex FMP54
High pressure/high temperature probe for level measurement in liquids; rod, rope and coax version.
- High diffusion resistance by ceramic coupling and graphite seal
- Ideal replacement for mechanical methods in bypasses, e.g. displacers
- Hot steam resistant

Levelflex FMP55
For applications with emulsion layer; rod, rope and coax version.
- Simultaneous output of the level and interface signal
- Second line of defense (gas tight feed through)
- Automatic calculation of the DK value of the upper media.

Levelflex FMP56
The basic sensor for solid applications; rope version.

Levelflex FMP57
The standard sensor for level measurement in solids; rod and rope version.
- Extremely robust, even under high tensile forces
- Appropriate for high solid silos

<table>
<thead>
<tr>
<th>Levelflex</th>
<th>Type</th>
<th>Measuring range ft/m</th>
<th>Temperature °F/°C</th>
<th>Pressure psi/bar</th>
<th>Min. DK value</th>
<th>Output</th>
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<td>0.7 to 148 0.2 to 45</td>
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<td>1.4</td>
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<td>−1 to +40</td>
<td>1.4</td>
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</table>
Ultrasonic level measurement

Prosonic

Non-contact measurement in liquids, pastes and bulk solids

The ultrasonic method is a tried and tested, as well as cost-effective solution for level measurement in liquids and bulk solids. Instruments are available as compact or remote versions. This measuring principle is characterized by easy planning and assembly, fast and safe commissioning, as well as 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.

Functional principle

The Prosonic family works with ultrasonic pulses which are reflected from the medium surface by the density change between air and the medium. The time between transmission and reception of the pulse is measured and analyzed by the instrument, which then provides a direct value for the distance between the sensor diaphragm and the medium surface.

Advantages at a glance

• Unaffected by product properties (for example: dielectric constant, density or moisture)
• Easy and fast commissioning due to preset application parameters
• Calibration without filling or discharging

Liquids or Solids
Prosonic T
2-wire ultrasonic device with compact design.
- For simple applications in open tanks and storage tanks
- As a relay variant for level limit detection (for example: at belt feed points)

Prosonic M
2-wire or 4-wire device with compact design.
- For sophisticated level measurement in liquids and bulk solids in storage tanks, agitators, on stockpiles and conveyor belts

Prosonic S
Ultrasonic measuring system for demanding applications, consisting of a transmitter (in a top-hat rail or field housing) and a sensor.
- Level measurement
- Flow measurement in open channels
- Pump and screen control
- Monitoring of crushers and conveyor belts
- 1, 2, 5 or 10 sensors may be connected

<table>
<thead>
<tr>
<th>Type</th>
<th>Measuring range</th>
<th>Temperature</th>
<th>Pressure (abs.)</th>
<th>Output</th>
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<td></td>
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<td>0.7 to 3</td>
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</table>
Capacitance level measurement

Liquicap

Measurement in liquids

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.

Advantages at a glance

- Accurate measurement in small tanks due to short response times
- Measurement from probe end to process connection, no blocking distance
- Technology tried and tested in millions of applications
- Interface measurement independent of emulsion layers
- Probes are pre-calibrated for full span (0-100%) in conductive fluids straight from the factory

Functional principle

The principle of capacitive level measurement is based on capacity change. An insulated probe (rod or cable) and the tank form a capacitor. The capacitance depends upon the product level – an empty tank has a lower capacitance while a filled tank has a higher capacitance. The measured capacitance is proportionate to the level.

Functional principle interface measurement

Media with a low dielectric constant (DK) cause very small changes of the capacitance value in level measurement while media with a high DK produce respectively large capacitance changes. In many interface applications, the medium with the lower DK is on top, for example oil on water. The upper medium provides only a minimum contribution to the overall capacitance value – only the water level (the interface layer) is thus issued as level.
Liquicap T
Cost-effective continuous level measurement for conductive liquids from 30 µS.
- Safe functioning unaffected by tank geometry
- Calibration not required (0% / 100% preset)
- Corrosion-resistant materials (for example: carbon fiber)

<table>
<thead>
<tr>
<th>Design</th>
<th>Measuring range</th>
<th>Temperature</th>
<th>Pressure</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM121</td>
<td>Rod probe</td>
<td>8 / 2.5 ft</td>
<td>-40° to 212°</td>
<td>4 - 20 mA</td>
</tr>
<tr>
<td>FM151</td>
<td>Rod probe</td>
<td>13 / 4 ft</td>
<td>-112° to 392°</td>
<td>4 - 20 mA</td>
</tr>
<tr>
<td>FM152</td>
<td>Cable probe</td>
<td>32.8 / 10 ft</td>
<td>-112° to 392°</td>
<td>4 - 20 mA/HART®, PFM</td>
</tr>
</tbody>
</table>

Liquicap M
For continuous level measurement and interface measurement in liquids.
- No calibration required for conductive liquids
- Especially suited to small tanks (measurement from the tip of the probe to the process connection, fast measurement)
- Integrated build-up compensation provides stable measured values
Hydrostatic level measurement

Waterpilot, Deltapilot, Deltabar
Level measurement in liquids

Hydrostatic pressure sensors for level measurement may be used in virtually all liquid media, from water 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 as well as in abrasive and corrosive media.

Advantages at a glance
- Tried and tested measuring principle for temperatures up to 752°F (400°C) and pressures up to 6,000 psi (420 bar)
- Easy engineering
- Measurement unaffected by tank design or surface foam
- Hygienic instrument designs
- Water/wastewater designs
- Process industry designs

Functional principle
Hydrostatic level measurement is based on the determination of hydrostatic pressure generated by the height of the column of fluid. The pressure is calculated on the basis of the following formula:

\[ P = h \cdot \rho \cdot g \]

- \( P \) = Pressure
- \( h \) = Level
- \( \rho \) = Specific weight (density)
- \( g \) = Gravity (constant)

In constant medium density the height \( h \) is the only variable in this equation. The pressure is thus a direct level measurement. Hydrostatic pressure sensors consist either of a dry capacitive measuring diaphragm of ceramics or a silicon sensor with a metal diaphragm.
**Waterpilot**
Compact device for level measurement in fresh water, wastewater and saltwater.
- Robust housing with probe diameters of 0.9/1.2/1.7 in. (22/29/42 mm)
- High accuracy ceramic sensor
- Integrated temperature sensor
- Materials conforming to potable water requirements

**Deltapilot S**
CONTITE™ measuring cell – waterproof, condensate-resistant, high long-term stability.
- Hygienic instrument design for foods and pharmaceuticals
- Safe two-chamber housing
- Reliable measurement at temperature changes
- Modular concept

**Deltabar S**
Applications in pressurized tanks, for example, in the chemical and petrochemical industry.
- Robust sensor technology with high overload resistance
- High accuracy and long-term stability
- Fault and performance monitoring from the measuring cell through to the electronics

---

<table>
<thead>
<tr>
<th>Waterpilot</th>
<th>Deltapilot M/S</th>
<th>Deltabar M/S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>FMX21</td>
<td>FMB50</td>
</tr>
<tr>
<td><strong>Measuring range</strong></td>
<td>psi</td>
<td>1.5 to 300</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>°F</td>
<td>°C</td>
</tr>
<tr>
<td><strong>Sensor</strong></td>
<td>Ceramic</td>
<td>CONTITE™ (metal)</td>
</tr>
<tr>
<td><strong>Accuracy (%)</strong></td>
<td>0.2 (option of 0.1)</td>
<td>0.2 (option of 0.1)</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>4 – 20 mA, 4 – 20 mA HART®</td>
<td>4 – 20 mA HART®, PROFIBUS-PA, FOUNDATION Fieldbus</td>
</tr>
</tbody>
</table>
One measuring principle for many different applications

Vibronics – the solution for point level detection in liquids and solids

Endress+Hauser led the way for safe and reliable level monitoring worldwide with the invention of the vibration principle almost 40 years ago. Today, point level detection has become an indispensable variable in process engineering. Float switches, capacitive, inductive, optical and ultrasonic switches are among those used for this purpose. The application and medium limitations of purely mechanical or purely electronic systems prompted Endress+Hauser to combine both systems into one measuring principle – the vibrating limit switches for liquids and bulk solids. State-of-the-art development tools such as the Finite Element Method, new production technologies and constant development have made a mechatronic success story of these limit switches.

Advantages at a glance

- Universally usable in the presence of air bubbles and foam (foam is not recognized as liquid)
- Universally usable for the detection of solids under water
- Universally usable in all pumpable liquids up to a viscosity of 10,000 cSt
- Universally usable because of the independence of flow properties of bulk solids
- Reliably in more than 3.5 million applications worldwide
- May be used in all industries independent of media
- Safety-oriented switching without calibration – also in case of an error
- Automatic monitoring is included in every Liquiphant or Soliphant M instrument
- Universal in any medium

Point level switches for liquids register the frequency shift which occurs as the fork is submerged in liquid.

Point level switches for bulk solids, damping of the oscillation is recognized and a switching signal is issued if it falls below a certain amplitude.
Competence in liquids
Safe measurement in demanding applications

Increased process temperatures
Point level measurement at process temperatures up to 536°F (280°C) (572°F (300°C) for maximum 50 hours) are no problem for the Liquiphant S FTL70/71. The requirements of materials and the development of instruments increase drastically in process temperatures above 390°F (200°C). Extreme requirements can only be realized by careful selection of suitable materials using state-of-the-art technologies and load simulation. Perfectly matched materials are required for permanent and reliable performance in extreme temperature fluctuations.

Hygiene design
The Liquiphant hygiene line meets food requirements with polished sensors, respective connections and stainless steel housings.
- Common connections, for example, sanitary, Varivent, DRD, TriClamp™ and NEUMO guarantee conformity.
- The stainless steel housing is characterized by its resistance to aggressive cleaning agents and offers the benefits of no dead space, due resistance and easy cleaning.

3.1.B certified materials
Process safety and reproducibility are terms which are becoming increasingly important, therefore, Endress+Hauser offers all parts in contact with the medium. For example, sensor and welding supplies in 3.1.B certified materials.

Second process separation
A pressure, gas or diffusion-tight feed-through as second line of defense prevents the medium from escaping into the atmosphere. Liquiphant M offers this second line of defense as an option and it comes standard in Liquiphant S FTL70/71.

In any industry
A decisive advantage of the vibration principle is its mode of operation. Level limits are recognized and remain unaffected by the physical properties of the medium such as conductivity, dielectric constant, viscosity, changes in density, pressure or temperature. In addition, turbulence, foam or bubbles do not impair the operation. These unique performance features allow Liquiphant and Soliphant to be used in all process engineering industries.

The most important industries include
- Chemical/petrochemical industry
- Pharmaceuticals (3.1.B and C.O.C)
- Foods
- Environment
- Energy
- Primaries

No mechanically moving parts and no need for calibration are some benefits of choosing vibronic limit switches. Together with integrated automatic monitoring, this leads to a reliable system which has gained great recognition in process automation.
Liquiphant

Point level detection in liquids

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

Advantages at a glance
- Unaffected by medium properties such as conductivity, dielectric constant, viscosity, pressure and temperature
- Highest degree of reliability and service life, even under extreme process conditions
- Tried and tested instruments

Functional principle
A tuning fork sensor is excited to its resonant frequency. The drive works piezoelectrically. The oscillating frequency or the amplitude changes as the fork enters the medium. The change is analyzed and translated into a switching signal.
**Liquiphant T**
Compact instrument for simple and hygienic applications.
- Very small instrument dimensions
- Hygienic stainless steel design
- External function testing

**Liquiphant M**
Diverse instrument variants in a modular system.
- Different construction lengths
- Process connections, housings
- Numerous electronic interfaces
- Special designs
- Density measurement

**Liquiphant S**
For highest process requirements and safety.
- Process temperatures up to 536°F (280°C)
- Functional safety SIL2/SIL3

### Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Liquiphant T</th>
<th>Liquiphant M</th>
<th>Liquiphant S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>FTL20</td>
<td>FTL20H</td>
<td>FTL50/51</td>
</tr>
<tr>
<td>Sensor length</td>
<td>inch/ mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.5/38</td>
<td>2.5/6 to 235</td>
<td>65/148 to 6,000</td>
</tr>
<tr>
<td>Temperature</td>
<td>°F/ °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-40° to 302°</td>
<td>-58° to 302°</td>
<td>-14.5 to 580</td>
</tr>
<tr>
<td>Measuring range</td>
<td>psi/bar</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-14.5 to 580</td>
<td>-14.5 to 928</td>
<td>-14.5 to 800</td>
</tr>
<tr>
<td>Process connections</td>
<td>G ½&quot;, ¾&quot;, 1&quot;</td>
<td>G ¾&quot;, 1&quot;, Flange DIN/EN, ANSI, JIS</td>
<td></td>
</tr>
<tr>
<td>Hygienic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>AC, DC, ASi-Bus</td>
<td>AC, DC, AC/DC relay, NAMUR, 8/16 mA, PFM, PROFIBUS-PA</td>
<td></td>
</tr>
</tbody>
</table>

![Images of Liquiphant instruments](attachment:images)

Density / Concentration

Vibronic – Liquiphant for density

Quality measurement in liquids

Utilizing the tried and true Liquiphant with all its varieties of process connections, housings and hazardous area ratings you can now measure density. You can measure the density of a product in a tank during a batching process. If you need to know when the grade or type of product in a pipeline changes then here is your solution. Complex computations that utilize 3-D tables like °Brix or °Plato are possible with the Liquiphant for Density.

Advantages at a glance
- Reduce costly manual lab tests
- Process monitoring and controlling in-situ and online
- Complying with tolerances is to increase quality
- Industry independent
- Any unit you require (°Plato, °Brix, °Baumé, etc.)

Advantages
- Large number of process connection to choose from
- Useable in hygienic applications
- Calculation of customer specific units (°Brix, °Plato, °Baumé, etc.) possible
- Up to 5 Liquiphant density sensors can be connect to the density computer FML621

Installation options
- Direct insertion in tanks and pipes

Process temperature
- 32 to 176°F (0 to 80°C) or -58 to 302°F (-50 to 150°C) with reduced accuracy

Process pressure
- 363 psi (25 bar)

Accuracy
- 0.002g/cm³

Reproducibility
- 0.0007g/cm³

Units of density
- Norm density, °Brix, °Baumé, °Plato, Volume%, concentration, etc. with 2D and 3D tables. Formula editor to calculate customer specific units

Output/communication
- 4-20 mA, relay, Ethernet, Profibus®

Approvals
- ATEX, FM, CSA, 3A, EHEDG, CRN, FDA, NACE

Additional information
- Used with temperature and pressure transmitter for compensation and increased accuracy

Application limits
- Gas bubbles or build-up at the sensor fork
- Fluid velocity >6.5 f/s (>2 m/s) in pipes

Functional principle
The frequency of the Liquiphant M changes relative to the density of the product. This signal is inputed into the FML621 density computer along with a signal from a temperature unit in order to calculate the actual density or concentration. Contact closures, 4-20 mA outputs or any variety of calculations can be provided by the FML621 for up to 5 separate applications at the same time.
Liquipoint, Probes

Point level detection in liquids

The conductive measuring principle offers the possibility for simple, safe detection of a limit value in conductive liquids. From secure inventories (minimum quantity) and the avoidance of tank overflow, to two-point and multi-point control (pump control), Liquipoint T performs.

Liquipoint T, Probes

Modular probe system for optimum adaptation to the application.

- 1 to 5 rod and cable probes
- Compact or separate instrumentation
- Front-flush solution for pipes

Functional principle

A change in resistance between two conductors (electrodes) due to the presence or absence of a medium leads to a switching signal. In single-rod probes, the metallic tank wall serves as a counter electrode. If the probe is not covered, the resistance between probe and wall is theoretically infinite. As the medium covers the probe (conductive connection to the tank), the resistance assumes a finite value. A current flows and is translated into a switching signal. The smallest medium conductibility which can be calibrated amounts to 5 µS/cm.

Advantages at a glance

- Simple, cost-effective principle
- Multi-point detection with one process connection
- Liquid food applications with FDA-compliant materials

<table>
<thead>
<tr>
<th>Type</th>
<th>Liquipoint T</th>
<th>Probes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FTW31 (rod)</td>
<td>FTW32 (cable)</td>
</tr>
<tr>
<td>Measuring range</td>
<td>inch</td>
<td>4 to 157</td>
</tr>
<tr>
<td></td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>°F</td>
<td>-40° to 212</td>
</tr>
<tr>
<td></td>
<td>°C</td>
<td>-40° to 100°</td>
</tr>
<tr>
<td>Pressure</td>
<td>psi</td>
<td>-14.5 to 145</td>
</tr>
<tr>
<td></td>
<td>bar</td>
<td>-14.5 to 145</td>
</tr>
<tr>
<td>Process connections</td>
<td>G 1½&quot;</td>
<td>G ¾&quot;</td>
</tr>
<tr>
<td>Output</td>
<td>DC, AC/DC relay, NAMUR, switching unit FTW325</td>
<td>AC/DC relay</td>
</tr>
</tbody>
</table>
Vibronic level measurement

Soliphant

Point level detection in bulk solids

The Soliphant range offers robust level limit switches for applications in powdery, fine-grained and lumpy bulk solids and solids with low density, for example, caused by fluidizing. The different designs allow application diversity – Soliphant can even be used in hazardous areas. Typical examples are found in primaries (cement, plaster), the chemical industry (plastic granules, detergents), the food industry (flour, sugar) and animal feed production (wheat, corn).

Advantages at a glance
- Unaffected by medium properties such as conductivity, dielectric constant, pressure and temperature
- Large range of applications due to fork and single-rod oscillation system
- Highest degree of reliability and service life, even under extreme process conditions

Functional principle
A single-rod or fork oscillating system is used as a sensor in the Soliphant family. The oscillating system (single rod/fork) is excited to its resonant frequency. The oscillation amplitude is damped as the product covers the sensor. Maintenance and calibration or specific settings are not required. External vibration or flow properties of the medium do not impair measurement.
Soliphant T
Compact single-rod sensor or with tube extension.
- No incorrect switching due to jamming medium
- Unaffected by external vibration due to detached drive

Soliphant M
Diverse instrument variants combined into a modular system.
- Different construction lengths
- Process connections, housings
- Numerous electronic interfaces
- Special designs
- Optional polished and coated sensor surface

Further applications
- Filling nozzle disconnection at a loading station
- Solids detection underwater

<table>
<thead>
<tr>
<th></th>
<th>Soliphant T</th>
<th>Soliphant M</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>FTM20</td>
<td>FTM21 (rod)</td>
</tr>
<tr>
<td>Sensor length</td>
<td>10</td>
<td>20/40/60</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>500/1,000/1,500</td>
</tr>
<tr>
<td>Temperature</td>
<td>°F</td>
<td>°C</td>
</tr>
<tr>
<td></td>
<td>-40° to 302°</td>
<td>-60° to 536°</td>
</tr>
<tr>
<td></td>
<td>-40° to 150°</td>
<td>-50° to 280°</td>
</tr>
<tr>
<td>Pressure</td>
<td>psi</td>
<td>bar</td>
</tr>
<tr>
<td></td>
<td>-14.5 to 360</td>
<td>-14.5 to 90</td>
</tr>
<tr>
<td></td>
<td>-1 to 25</td>
<td>-1 to 6</td>
</tr>
<tr>
<td>Density</td>
<td>lbs/ft³</td>
<td>g/l</td>
</tr>
<tr>
<td></td>
<td>From 12.5</td>
<td>From 0.6</td>
</tr>
<tr>
<td></td>
<td>From 200</td>
<td>From 10</td>
</tr>
<tr>
<td>Output</td>
<td>DC, AC/DC relay</td>
<td>AC, DC, AC/DC relay, 8/16 mA, NAMUR, PFM, TIIS, NEPSI</td>
</tr>
</tbody>
</table>
Capacitance

Minicap, Nivector, Solicap, Liquicap

Point level detection in liquids and bulk solids

Capacitive 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.

Functional principle

The capacitive level measurement principle is based on the capacity change of a capacitor due to a change in level. The probe [rod or cable] and the silo wall form the two electrodes of a capacitor. As product [dielectric constant > 1] enters the electric field between the probe and the silo wall the capacity increases. This capacity change is analyzed and leads, with the appropriate setting, to switching.

The sensors are largely unaffected by low build-up formation as long as the product does not create a bridge between the probe and the silo wall. Probes with active build-up compensation are used for media prone to strong build-up.

Advantages at a glance

- Tried and tested technology
- Universally adaptable probes
- Reliable performance also in viscous media or heavy build-up
Nivector, Minicap
Preferred in small tanks with powdery to fine-grained bulk solids.
- Calibration not required
- Small, compact design
- Easy sensor exchange in full silo by protector
- Integrated active build-up compensation

Solicap M/S
Robust instrument design for fine-grained to coarse-grained bulk solids.
- Probes easy to shorten
- High tensile loads up to 13,488 lbs (60 kN) for cable probes
- High lateral loads up to 590 ft/lb (300 Nm) for rod probes
- Process temperatures up to 752°F (400°C)

Liquicap M
Modular probe system for applications in highly viscous liquids.
- Temperatures from -112°F to 302°F (-80° to 00°C)
- Reliable level limit detection due to active build-up compensation
- Interface detection
- Two-point control (pump control)

<table>
<thead>
<tr>
<th>Nivector</th>
<th>Minicap</th>
<th>Solicap M</th>
<th>Solicap S</th>
<th>Liquicap M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>FTC968</td>
<td>FTC260</td>
<td>FTI55</td>
<td>FTI51</td>
</tr>
<tr>
<td>Design</td>
<td>Compact</td>
<td>Compact</td>
<td>Cable</td>
<td>Rod</td>
</tr>
<tr>
<td>Sensor length</td>
<td>inch</td>
<td>mm</td>
<td>5.5</td>
<td>140</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>500 to 6,000</td>
<td>20 to 866</td>
</tr>
<tr>
<td>Temperature °F °C</td>
<td>-4° to 176°</td>
<td>-20° to 80°</td>
<td>-40° to 248°</td>
<td>-40° to 170°</td>
</tr>
<tr>
<td>Pressure</td>
<td>psi</td>
<td>bar</td>
<td>-14.5 to 87</td>
<td>-1 to 6</td>
</tr>
<tr>
<td>Output</td>
<td>DC, AC</td>
<td>DC, AC/DC relay</td>
<td>DC, AC/DC relay, 8/16mA, PFM, 2-wire, 3-wire</td>
<td>DC, AC/DC relay, 8/16mA, PFM, 2-wire, 3-wire</td>
</tr>
</tbody>
</table>
Gamma level measurement

Gammapilot

Point level detection, level, density and interface measurement

As early as 1962, the first Endress+Hauser radiometric measuring lines were launched. Since then, more than four decades have passed and this measuring principle is still providing decisive advantages. Radiometric instrumentation is used where other measuring principles fail due to extreme process conditions or because of mechanical, geometric or construction conditions.

Advantages at a glance

- Four measuring tasks in one measuring principle
- Non-contact, external measurement for the highest degree of safety and reliability under the most extreme process conditions
- Functional safety according to SIL2/3 and IEC 61508
- Standardized communication via HART®, PROFIBUS PA or FOUNDATION Fieldbus
- Overspill protection WHG

The operating principle

The gamma source, either a cesium or cobalt isotope, emits radiation which is attenuated as it passes through materials. A transmitter, mounted on the opposite side of the vessel or pipe, converts this radiation into an electrical signal. The strength of this signal is essentially determined by the distance between the radiation source and the transmitter, as well as the thickness and density of any material between source and transmitter.

The actual measuring principle is based on the absorption of radiation by the product to be measured:

- The material absorbs almost all of the radiation in level or limit applications.
- In density or interface layer measurement, the absorption changes while a fraction of the original radiation still reaches the transmitter, even at maximum density.
**Source in the source container**
Different source intensities (activities) are available for various applications. The source is installed in the source container. Different overall dimensions provide optimum radiation protection.

**Gamma-Modulator FHG65**
For effective suppression of background and extraneous radiation (for example: from non-destructive materials testing). The Gammapilot M can separate useful signals from parasitic radiation by its modulated radiation. This separation enables continuing measurements, therefore increasing plant availability and the safety of measurements.

**Gammapilot M**
The variable transmitter concept with NaI crystal or plastic scintillators in different lengths guarantees optimum adaptation to individual applications. The transmitter contains a scintillator, photomultiplier and switching unit.

<table>
<thead>
<tr>
<th><strong>Gammapilot M</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>FMG60</td>
</tr>
<tr>
<td>Sensor length or measuring range</td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>2 in 50 mm</td>
</tr>
<tr>
<td>Continuous level measurement</td>
<td>With cascade mode as desired</td>
</tr>
<tr>
<td>Process Temperature</td>
<td>°F</td>
</tr>
<tr>
<td>Process Pressure</td>
<td>psi</td>
</tr>
<tr>
<td>Output</td>
<td>4-20 mA/HART®, PROFIBUS-PA, FOUNDATION™ Fieldbus, pulses for cascade mode</td>
</tr>
</tbody>
</table>

**Gamma-Modulator FHG65**
For effective suppression of background and extraneous radiation (for example: from non-destructive materials testing). The Gammapilot M can separate useful signals from parasitic radiation by its modulated radiation. This separation enables continuing measurements, therefore increasing plant availability and the safety of measurements.

**Gammapilot M**
The variable transmitter concept with NaI crystal or plastic scintillators in different lengths guarantees optimum adaptation to individual applications. The transmitter contains a scintillator, photomultiplier and switching unit.

Support through competence – from planning through to realization
- Comprehensive consultation by our Gamma Project Team (GPT) specialists
- Source and activity calculation using Applicator, Endress+Hauser’s product design and selection program
Interface measurement

Separate the best from the rest
Interface measurement for any application

It is not the instrumentation but your application which is most important. We provide the optimum interface measurement solution in relation to your process requirements. 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?
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 gamma – we support you in your application.

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 (DK), the other part penetrates the medium. As the signal enters the lower medium with a higher dielectric constant (DK) 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.

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.

Capacitance
Media with a small dielectric constant (DK) cause very small changes of the capacitance value while media with a high DK produce respectively large capacitance changes in level measurement. In many interface applications, the medium with the smaller DK 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).

Gamma
The gamma source emits radiation which is attenuated as it penetrates the container wall and the medium. On the opposite side of the container, a detector converts the radiation received into an electric signal. The measuring effect results from the fact that different interfaces absorb (attenuate) the radiation differently. If the transmitter has been calibrated to the media by wet calibration once, a correlation to the measurement of the interface results automatically.
The application determines the sensor

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<th>Measuring task</th>
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<th>Features / Advantages</th>
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| ![Clear interface](image) | **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 842°F / 5800 psi (450°C / 400 bar)  
• Probes can be shortened (rod) | • DK of the upper medium may be max. 10  
• Difference of the DKs between the two media must be > 10  
• Emulsion layer up to max. 2" (50 mm) allowable  
• For interface measurement, the thickness of the upper phase must be min. 2.4" (60 mm) |
| ![Clear interface](image) | **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 392°F (200°C)  
• PTFE-coated probe | • DK value changes of the upper medium affect the accuracy  
• DK value of the upper medium may be max. 10  
• DK value difference between both media must be >10  
• For interface layer measurement, the thickness of the upper phase must be minimum 2.4" (60mm) |
| ![Interface with emulsion layer](image) | **Capacitance** Liquicap FM1S1/52 | • 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 392°F / 1450 psi (200°C / 100 bar) | • Difference of the dielectric constant (DK) 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 DK changes in the upper medium  
• The total level is not measured |
| ![Interface with emulsion layer](image) | **Gamma** Gammapilot FMG60 | • Non-invasive and maintenance-free measuring method  
• Unaffected by pressure and temperature  
• Only slight influence by build-up  
• Unproblematic use in emulsion layers  
• Solution for multiphase interface layers using several detectors | • Density changes of the medium influences accuracy  
• The total level is not measured (possible with further source and detector)  
• Calibration with media necessary |
Certified quality

Our goal is performance

Test Center: Endress+Hauser USA

The Endress+Hauser Test Center (internationally accredited: DATECH, FM, CSA) has three laboratories – for instrument safety, application engineering and electromagnetic compatibility. The different test facilities enable us to ensure and improve the reliability and the quality of Endress+Hauser instruments under realistic test conditions. In addition, the instruments can be tested for new applications in advance, for example, during their development phase. In different “endurance tests” they are exposed to the same extreme conditions which are expected in later applications. These include tests involving dust (explosion protection), abrasion and attrition, temperature and moisture, mechanical stress tests and splash water. Apart from a fully automatic tank test facility of 1,585 gallons which enables us to simulate even the most difficult applications, the Endress+Hauser Test Center also operates an accredited EMC laboratory.

Advantages at a glance
- Measurements are traceable and reproducible at any time
- Combined theoretical and practical instrument safety
- Accredited EMC laboratory according to EN 45 001 requirements

Calibration

Quality has many components. On a company radar reference section, instruments are calibrated (if requested, under the supervision of a Bureau of Standards officer) with an absolute accuracy of 0.5 mm (2 sigma value) based on the international OIML R85 requirements. This calibration is recognized by numerous national calibration authorities (PTB, NMI, BEV, etc.) and constitutes the basis for the employment of the instruments in public custody transfer applications, for example, tank farms, ports, airports. Endress+Hauser offers complete inventory management systems for such applications.
Endress+Hauser’s broad range of measuring principles offers users a custom-made solution for their applications. A solution which not only satisfies the technical requirements, but also provides the right price-performance ratio.

Safety starts with selection

Safety-oriented instrumentation with SIL

The process industry demands the highest degree of safety and reliability from the components of distributed control systems (DCS). Endress+Hauser is the leading provider of SIL-certified instruments (Safety Integrity Level) in level, pressure, flow and temperature sensor technology.

The safety level required for a process plant is classified according to the international IEC 61511 and ISA standard and depends on the risk inherent in the plant. In order to reduce the risk to people, the environment and the plant, IEC 61508, the international standard for functional safety, describes the guidelines for instruments in protective functions. A DCS protection facility usually consists of an instrument, a control part and an actuator. Both standards subdivide plants and equipment into four safety categories – from SIL1 for low risks through to SIL4 for very high risks.

Software tools for safe selection

Applicator

Our Applicator program for the selection and design of process instruments has been tried and tested in practical applications for more than 20 years. Step-by-step, Applicator requests details on all important parameters. After the process limits have been entered, Applicator proposes suitable measuring principles or instrument range for the application.

But Applicator can do more than that:
- Easy and safe design of measuring points
- Project documentation (acquisition, archiving and retrieval of design results)
- Extensive databases with details of more than 300 media
- Conversion function for physical units

W@M
Web-Enabled Asset Management

To achieve the efficient asset management of instruments, access to all traceable technical and commercial data that pertains to each instrument’s life-cycle is of the utmost importance. Our W@M (Web-enabled Asset Management) is an enterprise portal, available on Internet, which enables a real-time access to all relevant data for the instrument’s maintenance until its replacement. From the time the instrument is selected until it is removed from the process, including procurement, installation, start-up and operation, you may link to the Endress+Hauser databases to access all technical documentation relative to the device and get all relevant information for easy follow-up of its measurement.
Endress+Hauser’s product portfolio

Level
- Capacitance (RF)
- Conductive
- Mechanical
- Vibration
- Ultrasonic
- Radar
- Guided radar (TDR)
- Hydrostatic

Pressure
- Gauge/absolute
- Differential pressure
- Hydrostatic

Flow
- Electromagnetic
- Vortex shedding
- Coriolis mass flow
- Ultrasonic
- Open channel
- D/P flow
- Thermal mass flow

Temperature
- Temperature transmitters
- RTDs/thermocouples
- Sensors

Liquid Analysis
- Conductivity
- pH/ORP
- Chlorine
- Dissolved oxygen
- Turbidity
- Chemical analyzers
- Nitrate/organic sensors
- Sludge level

Recorders
- Paperless recorders
- Visual data managers
- Safety data managers
- Displays
- Barriers
- Power supplies

Solutions
- Wireless networks
- Inventory control
- Energy monitoring
- Tank farm monitoring
- Life cycle management
- Plant asset management
- Flow management solutions

Service
- Start-up
- Training
- Calibration
- Maintenance contracts
- Installed base audit

ISO 9001 Certified

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