

Competence in Oil and Gas

Full range of solutions to increase safety and production efficiency

Oil and Gas



Endress+Hauser Organization

The Endress+Hauser Group

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

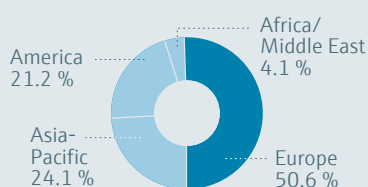
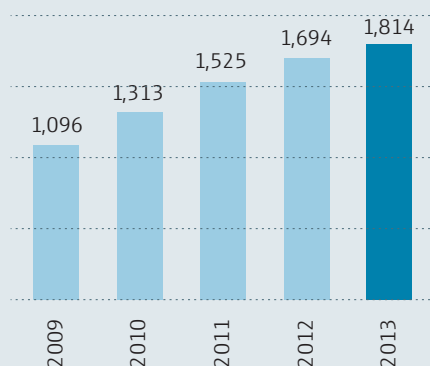
As a Swiss, family-owned business, Endress+Hauser is dedicated to instrumentation, plowing back all profits into the development of state-of-the-art process automation technologies. Since the beginning in 1953, Endress+Hauser has been a pioneer for cutting edge measurement and automation solutions.

The group comprises 71 legally independent companies in 35 countries. Innovative measurement and automation systems are manufactured in 23 production centers in Switzerland, Germany, France, the United Kingdom, Italy, China, Japan, India, Russia and the USA.

With a turnover of 1.8 billion euros in 2013, Endress+Hauser employs 12,000 personnel across the globe. The company's continuing growth is due to a culture of innovation – 5,700 patents and patent applications were already registered.

The strong profitability of the Group – equity of over 60 % – and the continuing commitment of the family ownership are guarantees for best in class instrumentation and solutions. Oil and Gas activities have contributed and continue to contribute to the tremendous growth of Endress+Hauser.

Net sales
(EUR in millions)



Endress+Hauser's motto: "We learn from the customers we serve"

Endress+Hauser products feature high reliability and availability, excellent quality and innovative technologies, as seen by the large number of innovation prizes awarded to us each year.

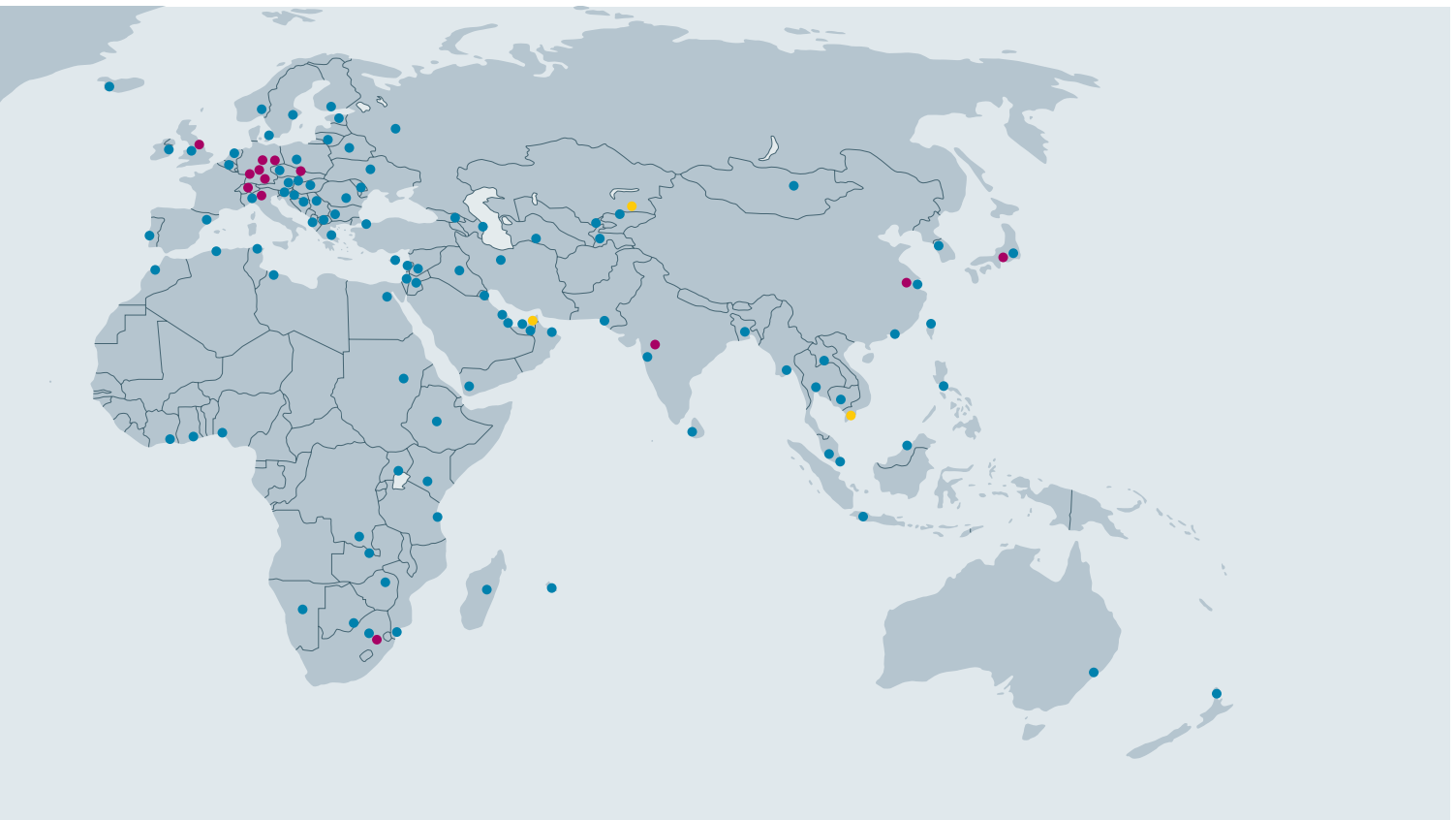
One of the key factors in our success is the closeness we have to our customers through building long-term relationships. We develop products and solutions working closely together with our customers.

Endress+Hauser men and women also work closely together with worldwide and local organizations, foundations and institutes, such as First Point Assessment Limited (FPAL) for cost reduction and performance improvement. Our instruments are designed and manufactured according to globally standardized certifications such as API, ISO and SIL. They also support communication standards such as HART®, PROFIBUS and FOUNDATION™ Fieldbus.



Find your contact:

www.endress.com/locations



Endress+Hauser Process Automation

Solutions for the Oil and Gas industry

Endress+Hauser offers a complete range of technologies to meet application requirements in the Oil and Gas industry. We cover all areas including exploration, production, refineries and logistics. All measurement instrumentation, including level, pressure, flow, temperature, water bottom, etc., are manufactured to the highest quality standards, to guarantee consistent performance and compatibility.

A tight network of more than 600 well-trained, service-minded product managers and sales representatives, together with local agents, gives Endress+Hauser a strong

presence across global markets. We offer service, spare parts and advice to help customers achieve what is right for them.

The company owes its good reputation to industry know-how, and to the creativity and commitment of its employees. Endress+Hauser stands for financial strength and continuity, the broadest range in its industry, and long-term customer relationships.



Oil and Gas website:

www.endress.com/oil-gas



Exploration



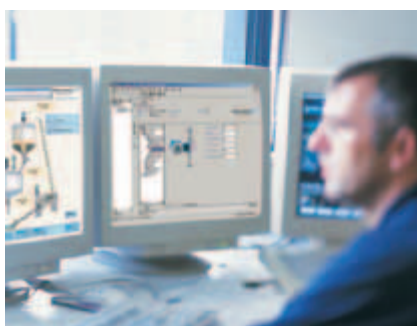
Production



Refining



Tank Inventory Management



Asset Management



Service and Support



Exploration – meeting the needs of Oil and Gas



Drilling mud Reliable level measurement and control of trip and mud tanks/silos are achieved by using the robust guided radar **Levelflex**. The guided radar runs an electromagnetic pulse along a cable or rod and is unaffected by dust or changing dielectric constants. Two Levelflex instruments can be installed close together for redundant measurement.

The **Promass F** mass flow meter is involved in the online mixing and blending of expensive mud (WBM and OBM) as well as in custody transfer measurement at the point of transfer to supply ships and mud tanks on site. The online measurement of density and viscosity keeps the mud parameters constant. The world's first digital pH measurement with **Memosens** allows for the precalibration of pH sensors in the mud logger cabin.



Cementation To ensure excellent cement quality for the batch, the **Promass Coriolis** mass flow meter monitors the flow rate online as well as the pumped cement density. The fast action **Levelflex** controls the level in the very small mixing pit on the truck.

Every drop of a chemical additive is quantified with **Promass A**, available at a diameter of 1 mm.



Fracking Online blending of frack jell is implemented with **Promass O (up to 3750 psi)** for mass flow, density and online viscosity measurement.

Cerabar S and **Deltabar S** pressure transmitters allow process operation of up to 700 bar/10,500 psi. These smart pressure transmitters have an integrated thermocouple and store all adjustments and settings in an integrated memory chip. Additionally, the last 25 hours of process operation are recorded.

All data from all the fracking units involved in the process are visualized and recorded in a paperless

Memograph recorder. This unit is also able to monitor setpoints, calculations and act as an independent PLC and communication unit.



Mud and gauge tanks Many activities in oil field exploration and production involve open and closed tanks for water, mud, fuel, etc. For all these applications, the level device that fits best must be selected providing simple operation, reliability and most of all, cost effective level measurement. A solution is always available from the large portfolio of Endress+Hauser, including **Levelflex** guided radar, **Liquicap** capacitive, **Prosonic** ultrasonic, **Micropilot** radar, **Deltabar** DP-level and many other alternatives.

In the application shown, a redundant Levelflex guided radar is used in a cement mixing bin. There is no cross communication interference and most importantly, only Levelflex can measure right up to the flange/ bracket due to the patented end-of-probe detection. Most appreciated by well servicing operators are Levelflex and Prosonic for their easy commissioning and reliable operation regardless of whether their operations are at the arctic circle or in the hot and humid tropics.



Discover your optimization potential:
www.endress.com/production-optimization-oil-gas

Production – safety and reliability

Separator A challenge for separator operation is the interface measurement and control between oil, emulsion and water. Also of great concern is the frequent maintenance work required by mechanical displacer type level devices and switches. The guided radar Levelflex is the ideal solution to replace such conventional displacers. Intrinsically safe Levelflex has no blocking distance. The transmitter can be exchanged without shutting down the process and therefore, does not require an isolating valve. The combined use of Levelflex and **Liquicap** capacitive level provides perfect indication of the oil/water interface in separators. Levelflex FMP55 with SensorFusion offers you the worldwide first combination of the capacitance and guided radar measuring principle. This guarantees perfect indication of the oil/water interface in separators. The vibronic **Liquiphant** is the most reliable and most proven-in-use point level switch worldwide for high and low level switch detection. The gamma density profiling system is also an effective alternative, especially in cases where deposition of sand and presence of emulsions need to be detected. Gammapiilot allows control and visualization of interface levels and sedimentations.



Water and steam injection The Vortex shedding type **Prowirl** with integrated flow computer and temperature measurement allows for direct cost control of the individual injection process to the various wells. All injection parameters like pressure, temperature, salinity, turbidity, pH, flow rate and energy consumed can be transmitted to the control room

via **Fieldgate**. It provides bidirectional communication, allowing you to call the well via mobile phone and check, for example, the flow rate at any time. You can also set up to three alarm points for each transmitter. In addition, Fieldgate allows service technicians to quickly commission and service a transmitter remotely from any location worldwide.



Satellite and pump station One of the costliest areas of separation and pipeline pumping are the expensive demulsifier and Drag Reduction Additives (DRA) injected to support demulsification and to reduce pipeline drag. Optimal use of these chemicals in parts per million (ppm) quantities ensures the lowest operating expenses and best process performance with good separation and higher pipeline flow rates. **Promass A** mass flow meter, for the smallest flow rates, counts every drop of your chemical injection.

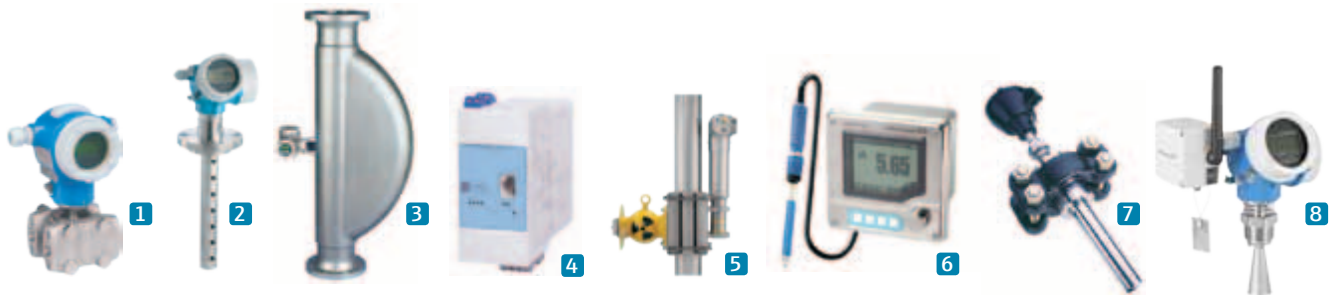


Production Regardless of whether for subsea or top side application, Endress+Hauser offers the best fit solution to monitor your production flow, for example, with **Subsea Venturi**. The **Deltabar S DP** transmitter offers an integrated DP-flow mode for easy and fast commissioning. Therefore, if the handheld is not available, you can still quickly commission the DP-flow transmitter. The integrated memory chip stores all settings and events and records the measured flow rate. In conjunction with a net oil computer (NOC) based on OLE for process control (OPC), we provide a fully operational and fully commissioned flow metering system. With the largest portfolio covering almost all metering principles, Endress+Hauser is able to advise you on the best fit and most cost-effective choice. This could, for example, be radiometric level detection installed on a knockout drum without requiring a shut down.



More information about safe operation:
www.endress.com/safety-oil-gas

Products



1 Cerabar S / Deltabar S

As the safest pressure transmitters on the market, Cerabar S absolute pressure and Deltabar S differential pressure transmitters offer unique technological innovations for high-end pressure measurement. They offer an intelligent operating and device concept and undergo strict DKD/DakKS calibration. They also provide PROFIBUS, FOUNDATION™ Fieldbus and HART® communications.

2 Levelflex

Continuous level measurement in liquids. Suitable for hazardous locations including SIL2 for Emergency Shut Down (ESD). Levelflex is used for continuous level measurement of liquids, pastes and slurries. The measurement is not affected by changing media, temperature changes, gas blankets or vapors. The multiparameter interface measurement option combines the capacitive and guided radar into one instrument which provides reliable and continuous measurement of the oil level and water oil interface.

3 Promass F

Robust Coriolis mass flow meter measures volume, mass flow and density of liquids and gases for applications on well servicing trucks (up to 3750 psi) and for fiscal and custody transfer purposes. It is used in cement, frac gel, drilling mud and acid. PTB and NMI approved according to OIML R 117 class 0.3 and API Chapter 5, Section 6. It counts mere drops reaching over 200,000 BOPD. It has no moving parts, requires no additional devices, requires no inlet section and is independent of process vibration.

4 Fieldgate

Fieldgate is the gateway for remote monitoring, remote diagnosis and remote configuration, via Web browser, of connected HART® sensors/actuators, either via telephone lines, Ethernet TCP/IP or GSM mobile communications, including SMS. It offers 0...20 mA, PROFIBUS and FOUNDATION™ Fieldbus communications.

5 GammapiLOT

Radiometric measurement is the only true window to a separator or treater for level, interface, profiling and density. It monitors and controls the internal process by looking through the vessel wall into the process. External installation is possible. It is unaffected by process conditions like pressure and temperature. The operator has an overview of the density profile of the separator/treater.

6 Memosens

The world's first digital pH sensor allows for precalibration in your office. An inductive coupling system ensures perfect digital signal communication between the pH sensor and the transmitter. The calibration values are stored inside the sensor. The metal free inductive coupling eliminates any contact influences of the conventional type.

7 Thermowell - HP

For offshore applications, extremely high pressures and high flow velocities in aggressive and corrosive media require a special design and know-how to increase the lifetime of the temperature sensor and ensure accurate measurement. The high pressure thermowell design, with DNV type approval, is available in 316 stainless steel duplex, super duplex and 6Mo. For lower pressures, DNV devices for flanged constructions are available.

8 WirelessHART

The WirelessHART system saves a lot of money due to less cabling costs and less time to startup a system. Endress+Hauser WirelessHART is also compatible to third party instruments with analogue or HART output.



Detailed product information:
www.endress.com/products



ATEX



NMI



Refining – a complete solution

Mass balance and energy control In order to fulfill governmental, environmental and economical requirements, efficiencies and losses of individual refinery units must be recorded. Only **Promass Coriolis**, available from 1 to 250 mm, records mass flow in tons/hr for gas and liquid flow directly and has approval for fiscal metering.

Energy Manager calculates the energy consumption for various types of process media. According to international norms and standards, calculations can be simultaneously performed for three different processes.

Desalination With over 50 years of experience in waste water treatment, Endress+Hauser is the first choice to measure all kinds of parameters dissolved in water. A selection of portable and permanently installed sampling units allows for easy analysis of the vast amounts of water being used in desalination and other units. **Liquiport** is a small, portable and cooled sampling containment unit with an integrated data logger and power supply to be operated in Ex-zones.

Distillation **Levelflex** easily rises to the challenge of providing reliable level measurement for the individual trays which can be prone to clogging. This guided radar is very user friendly and does not require a hot work permit to replace a conventional displacer. The antenna length of the rod can be adjusted as required, if not ordered to length, and the transmitter can detect its own probe length. For the ESD system, the **Liquiphant** point level switches, with an installed base of over 2,300,000 units and a SIL2/3 design and TUV certification, is your most reliable choice and worldwide proven in use.

The ceramic membrane of the **Cerabar** pressure sensor is the most reliable pressure measurement in vacuum. It is extremely rugged and designed to handle pressure hammers or other mechanical shocks. Endress+Hauser pressure gauges even meet nuclear power plant requirements.

Water treatment The many furnaces producing heat and steam demand professional boiler water treatment and monitoring. Endress+Hauser provides for the entire range of water analysis parameters and stores the data parallel to DCS or PLC in the paperless **Memograph** recorder. In case, for example, the boiler water salinity is rising above the threshold, Memograph activates alarm functions and records them to make them tamperproof.



Desulphurization Endress+Hauser has grown to be one of the world's leading temperature transmitter suppliers. Proven in use in many applications around the world, the multipoint temperature assembly contains, for example, 15 individual thermocouples mounted in an individual nozzle. Your vessel requires only a minimum number of nozzles and openings to provide enough temperature measuring points for 3D monitoring. With the use of the Endress+Hauser **Octoplus**, the multiple thermocouples can even be retracted and changed during vessel operation, avoiding an unplanned shut down.

Blending The fast action and response time of less than 50 msec from the **Promass Coriolis** mass flow meter allow for online blending of lube oil. Combined with a batch controller, the integrated function chip accurately monitors the blending process. The single tube **Promass I**, in addition to mass flow, density and temperature, measures the dynamic viscosity and provides online quality control output of lube oil viscosity.

Catalyst Regardless of whether in a lock hopper, disengaging hopper, reactor reduction zone or surge hopper, all applications require a non-intrusive measurement. With the development of the first continuous radiometric level measurement device, with a sensor length of up to 2 m/6.6 ft, Endress+Hauser pioneered a solution for the toughest applications. Today, our **radiometric devices** measure point level, level, interface and density and are standard in many licensed processes.

Coke drum In a coke drum, continuous radiometric level measurement provides a huge potential to optimize the process by visualizing the coke and foam levels. Defoaming agents are only added as required. A SIL2 certified **radiometric high level switch** for overspill protection allows for optimum utilization of the coke drum height.



More information about refining:
www.endress.com/refining



Products



1 Gammapilot

Radiometric measurement is used for point level detection, interface layer and density measurement. The instrument line comprises the compact transmitter and the syntilation type detector up to 2 m in length in stainless steel. Stackable units of 2 m each allow for the monitoring of even high vessels. Due to the external mounting of this device, it is unaffected by temperature, pressure and aggressive fluid inside the vessel. Gammapilot can basically see through the vessel. In addition, installation does not necessarily require a shutdown, resulting in time and cost savings.

2 Promass I

This single, straight tube mass flow meter offers mass flow, density and temperature measurement. Optionally, it provides viscosity measurement directly online. For example, fuel oil applications can now be controlled by maintaining constant viscosity. Viscosity measurement also allows for better quality control.

3 Levelflex – HT/HP

Levelflex FMP54 for continuous level measurement in liquids under extreme conditions. The process connection with its ceramic-graphite seal safeguards high temperature and high pressure applications as they occur in steam boilers and toxic media like ammonia. The gastight feedthrough guarantees additional safety. Only the gas phase compensation of the FMP54 gives reliable results in case of gas and steam phases. Reliable measurement in case of moving surface and foam or in changing media.

4 Memograph M

Versatile, intuitive solution with secure data recording, visualisation and user-friendly operator concept. Up to 20 analog and up to 14 digital inputs make the device versatile and enable it to record and document entire machine sequences or processes. Available with various interfaces, PROFIBUS® DP, Modbus and Ethernet connection. Special application packages are available: Mathematics, tele-alarm for remote monitoring and control and energy software for energy content calculation of water and steam.

5 Energy Manager

Highly accurate flow and energy calculation for various types of process media. The evaluation is according to the most up-to-date international norms and standards with a single device, irrespective of whether the energy is derived from gas, liquid, steam or water. In addition, several calculations can be performed for three totally independent applications simultaneously in one single unit.

6 Tube skin thermocouples

Designed and tailor made to suit individual applications and furnace constructions. The Hast X-pad type thermocouple assembly is the most commonly used tube skin. In very harsh environments, protection heat shields, insulating shields and ceramic fiber sheath protection are available.

7 Liquiport

An automatic, portable sampler for the analysis of liquids. It offers menu-guided operation with "Quick-Setup" for rapid commissioning of the data logger. Wetted parts can be easily mounted, without tools, for easy cleaning and maintenance. The sampler compartment can be cooled, locked and sealed and carried separately for easy and safe transportation based on legal requirements. Also, it is designed for use in hazardous areas.

8 Omnigrad S

Compact temperature assembly providing high reliability and excellent performance in harsh industrial environments. The transmitter with backlit illuminated display features HART® or FOUNDATION™ Fieldbus communications with dual sensor input for resistance thermometers, thermocouples and resistance and voltage transmitters. Sensor breakdown information and backup, drift alarm and corrosion monitoring avoids shut downs and ensures high process availability.



Detailed product information:
www.endress.com/products



Metering – delivering the know how

Crude oil loading station Loading a crude oil tanker easily amounts to a transfer value of over \$1,000,000 US/hr. Consequently, an uncertainty of only $\pm 0.1\%$ reaches a value of up to \$1,000 US for every hour pumped. The new generation **Promass Coriolis** mass flow meter, proved on the SPSE (Société du Pipeline Sud Européen) calibration rig, has an uncertainty of better than $\pm 0.1\%$. As you can see, there is huge potential for your company to increase revenue for the same amount of crude sold, by reducing the uncertainty by only 0.1 %.

Gross volume, standard volume and net oil Common standard technologies are used to measure the tank inventory manually with measuring tape or by using precise level measurement with mechanical float and tape or highly accurate radar or servo technology. However, to reach standard volume or even to easily compare mass figures, temperature, crude oil density, strapping tables, expansion functions and more should also be considered. Temperature has a large expansion effect: the crude oil expansion is considered 0.1 % for every Kelvin, which results in 1 mm/m. For a 22 m/70 ft high tank, this is 22 mm/114 in. Therefore, for a standard tank size of 80 m/260 ft diameter, a change of only 1 mm represents a volume of 32 bbl/5 m³. Influences of wind, tank bottom distortion or the sun burning on the tank can cause additional errors which cannot be determined. A tank gauging system together with a mass flow meter allows you to manage and optimize your inventory.

Before larger size mass flow meters were available, turbine and positive displacement (PD) measurements were the only choice. Measurement by turbines and ultrasonic technology had to be converted to volume flow. Besides PD meters, turbines and ultrasonic flow meters are effected by fluid properties, which must be corrected for density and viscosity changes. Today, **Promass F** mass flow meter directly measures mass flow in tons/hr. Multiplied only by measured density, Promass outputs gross volume in BOPD or m³/hr. Furthermore, the measured density from Promass can be converted to standard density using today's flow computers, providing standard volume as well.

Oil calibrated mass flow meters With the new development of the large size **Promass F**, Endress+Hauser mass flow meters are now available for you with a calibration certificate based on various crudes and refined oils ranging from 0.7 cSt. to 300 cSt. Based on this feature, Endress+Hauser customers achieve a new level of transfer accuracies at the point of loading and unloading. Furthermore, a flow metering station based on the Promass involves absolutely no moving parts.

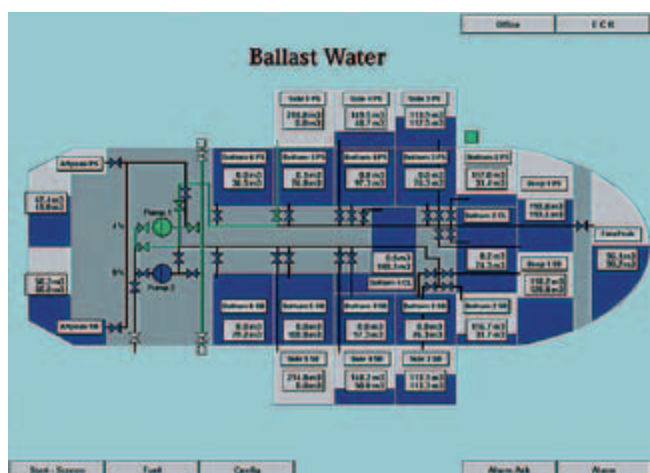
Integrated advanced diagnostics allow constant monitoring of the long-term stability of the meter. For this reason, no proving station is required. Proven performance allows for batch uncertainties of better than $\pm 0.1\%$, according to OIML R117, class 0.3. Remember how much money that means for every 24 hrs pumping? Additionally, Endress+Hauser provides bidirectional calibration for on and off loading service as well as calibration of tandem units for high flow rates.

Online proving When there's a need for online proving, the **Promass Coriolis**, with high turn down allows online proving with small size and affordable piston provers on site, even for high flow rates. A metering station with Coriolis requires no straight runs, flow conditioner or strainer, allowing for minimum space requirements and maximum cost savings. As a result, a full size metering station with an integrated prover can be positioned even on a small size jetty.

What benefit does this provide? Promass provides a direct and highly accurate reference to classic tank gauging and ship surveyor tank measurement, eliminating any discussion on discrepancies. Additionally, with density measurement, you have quality control of the product pumped.



Transportation



Ballast water All floating vessels, ships, barges, tankers, FPSOs, jack-ups and semi-submersibles need a ballast water system. In order to challenge the often aggressive sea water, Endress+Hauser developed the first metal free hydrostatic level measuring sensor, **Waterpilot**. For a contact free level measurement in dip pipes or sounding tubes, Endress+Hauser provides a radar together with a patented adapter to allow for manual gauging as well as automatic measurement through the same tube. A special design enables the radar to also measure in fuel tanks down to a level of only two inches.

Tank management Endress+Hauser's PC program **Shipview** visualizes the entire tank, pipe, valve and pump arrangement and allows for full control and operation of valves and pumps. Communication is done by intelligent, digital linking with a bus system from the individual level instrument to the PC control system. Tank operation can be carried out from any position onboard the ship. Additionally, all commissioning work can be performed there as well.



FPSO settling tank measurement A settling tank of an FPSO is a perfect example to show the overall advantage of a full range instrumentation supplier. No less than three different measuring principles are involved. The **Levelflex** guided radar measures the overall tank level, and the **Liquicap** capacitive sensor stretching over the entire tank height checks the oil/water interface and mixture. Three **Gammapiilot** radiometric density detectors check the fluid densities for oil export, recirculation and water bottom. This way, the operator only pumps emulsion free and water free oil through the export line. Also, the water bottom drainage is always free from oil for proper display.

Bitumen Loading of highly viscous bitumen at temperatures exceeding 150 °C/302 °F requires a highly reliable level switch. In the application shown, mechanical level switches were used in the past which always got stuck due to bitumen build-up. **Liquiphant** meets this demand and is immune against heavy buildup.



Read more about oil storage and transportation:
www.endress.com/oil-gas-storage-transportation

Products



1 Micropilot

Intrinsically safe transmitter for continuous, non-contact level measurement. Implemented in sounding tubes to measure fuel, diesel, lube oil, water or ballast water. The patented adaptor allows radar and manual type measurement in the same sounding tube. The patented reflector at the bottom of the sounding tube allows measurement down to about 50 mm/2 in, even in low dielectric constant media. Retrofit is possible.

2 Electronic DP

All disadvantages of the impulse lines and temperature differences in capillaries are simply vanished as electronic cables are used to connect the sensor with the transmitter. The Deltabar FMD71 and FMD72 system uses proven pressure sensor technology in a new and innovative way. The system consists of just one transmitter and two sensor modules. One sensor module measures the hydrostatic level (high pressure) and the other one the head pressure.

3 Levelflex

Smart transmitter for continuous level measurement in liquids and solids. Measurement is independent of density, dielectric constant of product, turbulent surfaces and boiling liquids. Therefore, it is a reliable solution for LPG/LNG on land and onboard ships. WIB (Working-party on Instrument Behavior) tested and recommended.

4 Promass

Robust Coriolis mass flow meter measures volume, mass flow and density of liquids, gases and liquefied gases (LPG, LNG) for fiscal and custody transfer purposes. PTB and NMi approved, according to OIML R 117 class 0.3 and API Chapter 5, Section 6. It counts mere drops reaching over 700,000 BOPD – up to 14". No moving parts, no additional devices, no inlet section and independent of process vibration. Temperature range -200°C...350°C / -328°F...+662°F, covering all applications.

5 Liquiphant

Reliable and universal limit detection – minimum and maximum – in liquids using the vibration principle for tanks and vessels up to 280°C/536°F or pressure up to 100 bar/1450 psi. Used for leak detection, overspill protection, and it protects pumps against running dry. Independent of medium properties, it is the original vibration switch with the largest installed base. One single device achieves SIL3.

6 Prowirl

Vortex shedding flow meter – measuring gas, liquid, steam and LNG. As a combined flow computer, flow meter and temperature device, Prowirl provides for direct mass metering together with a pressure input. Available in a compact or remote version. A dual sensor version provides two redundant measuring points in one unit. Two units, flange to flange, provide perfect bidirectional measurement.



Detailed product information:
www.endress.com/products

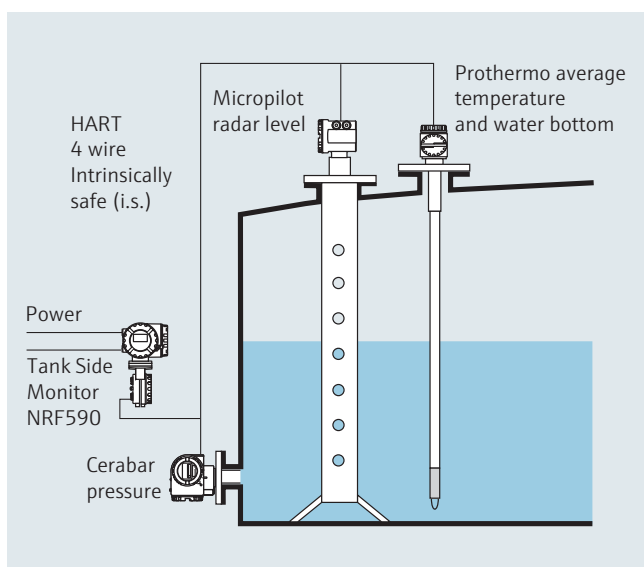




Tank Inventory Management

To monitor bulk liquids in tank farms and terminals, Endress+Hauser offers the full range of tank gauging solutions for inventory control and custody transfer applications, including radar, servo and mechanical tank gauging, inventory management software, and Coriolis mass flow meters with net oil computation and batch control. All tank gauging instruments and systems are designed and produced by Endress+Hauser, including level, pressure, multi-spot for average temperature, water bottom, flow and integration and communication devices. Our tank gauging system is compatible with virtually all existing communication protocols.

Radar tank gauging The **Micropilot FMR532** is used for custody transfer and inventory control applications with NMI- and PTB-approvals. It meets the relevant requirements according to OIML R85 and API 3.1B. The FMR532 with planar antenna is specifically suited for stilling well applications. Micropilot FMR532 offers cost-effective and simple installation via 4-wire cable with HART and 24 V DC intrinsically safe power supply. The unit can be easily retrofitted on tapered wells, formally with float and tape, without the need to remove the tapered section. In combination with radar, the **Tank Side Monitor** offers a unique, simple and above all, safe wiring concept. Intrinsically safe power is provided at the tank side for all integrated tank sensors.





Servo tank gauging State-of-the-art **Proservo**, based on the principle of displacement measurement, is a high accuracy level gauge used especially for LPG and LNG. It measures the level with an accuracy of better than 0.7 mm. It also measures product density, oil/water interface level and performs density profiling.



Multispot average temperature and water bottom Precise tank gauging measurement also requires precise temperature measurement. Temperature defines the volume correction factor (VCF) for calculation of net standard volume. As well understood, each Kelvin represents a level change of $0.1\% = 1 \text{ mm/m}$. **Prothermo** provides temperature profiling with multiple sensors. A water bottom detector with a standard length of 2 m defines the interface with an accuracy of $\pm 2 \text{ mm}$.



Read more about optimized inventory management:
www.endress.com/inventory-management

Distribution

On the distribution side of the hydrocarbon supply chain, Endress+Hauser provides precise instrumentation with no moving parts. In addition, **Fieldgate** transmits measurement data automatically back to the office for remote monitoring and control.



LPG road trucks Due to their accuracy, low price and maintenance-free operation, **Promass Coriolis** mass flow meters are continuously replacing the classic PD meters. One great advantage over PD meters is that Promass does not need to be regularly calibrated. A two year period is sufficient, as recommended by most weights and measures authorities. Direct mass measurement is another advantage, since LPG volume varies even with small temperature changes such as those during the day. Also, the very small size makes Promass an easy retrofit. Customer surveys on weight bridges showed incredible accuracies and repeatability.



LPG bottling station Returned LPG bottles are not always fully empty. For that reason, a weight bridge system measures and calculates the exact quantity missing. The correct batch based on the missing mass is controlled by **Promass**. Employing the guided radar **Levelflex** on bullets and spheres, customers now have a radar level measurement solution requiring no additional block valve below the radar device. This is due to the antenna of Levelflex with maintenance-free feed-through. Additionally, the transmitter can be removed from the antenna at any time without the need to shutdown the process.



CNG gas stations With the increasing number of vehicles running on compressed natural gas (CNG), there is consequently an increasing amount of CNG gas stations. The extremely compact **CNGmass** for natural gas refueling can be easily built into each gasoline pump. Its excellent measurement accuracy and repeatability always guarantee that vehicle owners receive the exact amount of fuel that they pay for – down to the cent!



Airport fuel trucks Many international airports use mass flow measurement for airplane fueling. **Promass** is ideal due to its small size and fits easily on the refueling truck.



Detailed product information:
www.endress.com/products

Products



1 Micropilot S

High accuracy level gauge for continuous, non-contact measurement. Designed for inventory control, and NMI and PTB approved for custody transfer. Intrinsically safe, eliminating any possibility of electrical danger on the tank roof. The local display with graphical reflection signal, provides instant feedback and control of radar performance during commissioning. In stilling well applications, the planar antenna provides for automatic diameter detection for easy commissioning and operation.

2 Proservo

The Proservo level gauge utilizes displacement technology to provide high accuracy level measurement, density profiling and interface detection. Proservo integrates all measurement data, including spot or average temperature, pressure and alarms. In addition, it converts the data for transmission to the control room via standard field protocols.

3 Tank Side Monitor

Tank side display providing intrinsically safe power at the tank side for the radar and other sensors, increasing plant safety. It integrates data from Micropilot radar and other tank sensors and performs tank calculations. Data is transferred to the control room via most industry communication protocols.

4 Prothermo

Prothermo is an intelligent multi-spot average temperature device with an optional water bottom interface probe. For average temperature measurement, the Prothermo measures the average product and vapor space temperature with up to 16 Pt100 elements and supplies a HART®-compatible output.

5 CNGmass

Extremely compact CNGmass for natural gas refueling can be easily built into each gasoline pump. High accuracy and repeatability guarantee that vehicle owners receive the exact amount of fuel that they pay for – down to the cent. CNGmass is PTB approved for custody transfer for gases with pressure above 100 bar, maximum pressure of 350 bar.

6 Tankvision – Inventory monitoring system

Endress+Hauser's web based inventory monitoring system is custody transfer approved and monitors level and inventory, sets alarms and prints reports. The system architecture allows you to operate your tank farm without installing any inventory software. It brings together all measurement data into one self explanatory, efficient and easy-to-read system. Measured and calculated variables (including tank strapping tables), such as level, temperature, mass, water level, vapor pressure, density and net standard volume (NSV), are displayed at an unlimited amount of local or worldwide operator workstations.



Detailed product information:
www.endress.com/products





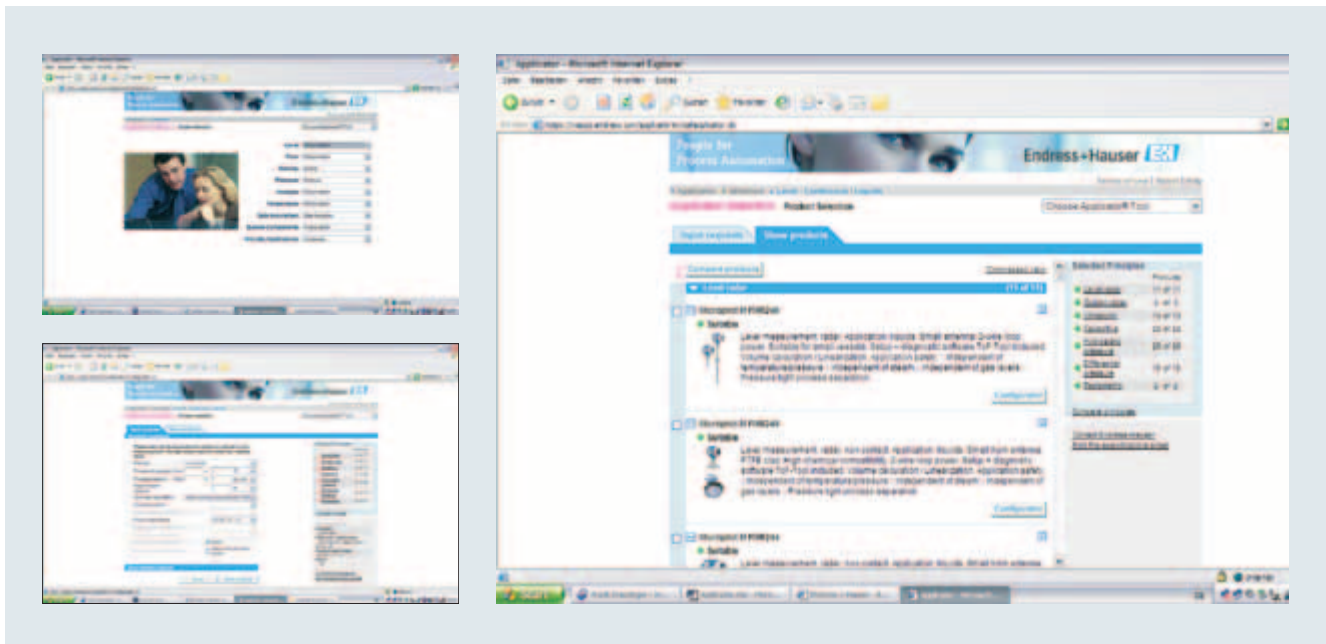
Simplify your daily engineering work

Applicator is a comfortable selection and design tool to determine and select the suitable product for the respective measuring task. During the planning process, you obtain a selection of suitable products and solutions by entering specific application parameters.

Different measuring principles and products can be compared in an uncomplicated manner. In this way, you arrive quickly and easily at the right product for your application.

The business sectors are

- Level
- Flow
- Density
- Pressure
- Analysis
- Temperature
- Registration
- System components



Quickly find the best fit instrument

- Plant overview for easy navigation
- Representation of control and navigation strategy
- Comparison of products and solutions
- Tender texts and online documentation
- Oil and gas image navigation simplifies product selection

Manage engineering projects from the start

- Simple design of measuring points
- Easy project management
- Project documentation (recording, archiving, retrieval of design results)
- Extensive databases with information on more than 300 fluids
- German and English language versions (in preparation: French, Spanish, Russian, Chinese and Japanese)
- Conversion functions for physical units.



Receive it free of charge!

Applicator can be accessed through the Internet or ordered on DVD for local installation on your PC. The data records of the Internet version are updated on a regular basis and can be downloaded to your PC at any time.



Learn more on how to select and size product:

www.endress.com/applicator

Plant Asset Management – solutions and services

Does your plant have availability problems? Can you react quickly to device malfunctions and failures? These are just two aspects of plant operation where Plant Asset Management brings significant improvements as well as a reduction in operating costs.

Endress+Hauser offers Plant Asset Management solutions and services tailored to the workflows and business processes found mostly in the MRO phase of the plant life-cycle. They comprise anything from a simple device through asset management systems fully integrated into your MES or ERP environment to service level agreements.

Device setup and replacement We can provide either the means to set up your devices or commission them for you as part of a project. We offer a mobile solution with handheld and a network solution with software.

Inspection and monitoring of assets A prerequisite for efficient handling of all plant asset management activities is a detailed knowledge of the plant equipment. When Endress+Hauser has been involved with the engineering, installation and commissioning of a new plant or plant extension, one deliverable will be information on the field devices present. For existing plants we can inspect and register your installed base and provide you with a risk analysis highlighting potentially critical devices and proposing remedies.

Calibration management Our calibration management solution allows you to schedule and track your instrument calibrations as well as to produce electronic reports that are compliant with FDA 21 CFR Part 11. The solution interfaces to our own as well as all common mobile calibration platforms.

Maintenance management Our maintenance management portfolio spans a range of services from consulting through to the provision of an on-site maintenance team. We will look at your plant with fresh eyes, identify areas of improvement and bring recommendations to efficiently manage and perform your maintenance and calibration activities.

Spare part management Spare part management is based on our equipment records, which may be accessed through an internet portal or installed on your site. By simply entering the serial number of your device you have access to its manufacturing history, current availability, spare parts, calibration certificates, device driver and documentation.

Documentation management We offer two ways of managing documents: either by a direct connection to our equipment records or using our plant asset management solution. Here, documentation can be stored and accessed from the virtual measuring point. In both cases, documents, e. g. for third party devices can be added manually.



Benefit of optimized Plant Asset Management:

www.endress.com/plant-asset-management



Endress+Hauser can help you reduce operating expenditure by optimizing the associated workflows

Improve productivity with information at your fingertips

To manage the asset you need to have the relevant data on the asset... and for the average user they have no time to find and load this data into their asset management system. The latest instruments using HART®, PROFIBUS or FOUNDATION™ Fieldbus can readily exchange the information with an Asset Management system. But what about the existing installed base? What about the discreet devices – the low cost instruments that are important in the process but time consuming to find the data? This is the strength of W@M Life Cycle Management. We take care of all the data for you within our equipment record automatically.

The information platform providing data flow and archiving for the technical and operational management completely, conveniently and at any time and place. It comprises the processes from engineering, procurement, installation and commissioning, to operation and servicing of the plant. This is achieved by an open and flexible system, based on Intranet-/Internet technology, interlinking all tools, products and services from Endress+Hauser. W@M Life Cycle Management ensures fast access and perfect information flow to improve process safety, productivity and economic efficiency along the complete life cycle of your plant.



More information about W@M:

www.endress.com/lifecyclemanagement



Service – by your side

At Endress+Hauser, customer service doesn't end with the sale

Our network of service engineers spans the globe, ensuring that wherever you are based, you can benefit from our technical expertise and support. Our service departments offer comprehensive maintenance contracts, Instrument Management Solutions (IMS), workshop repairs, spares management, on-site commissioning, trouble shooting, small installations and a technical service helpline providing telephone advice and support.

Training: investing in people Endress+Hauser provides hands-on training at your location on site, at our local office in your area or at our state-of-the-art training facilities.

Endress+Hauser offers sound, professional advice for all your training needs. Our training programs can be tailored to meet your specific requirements.

Customer service at a glance

- Commissioning and installation
- Project management
- Preventive maintenance
- Spare part express service
- Training
- Helpdesk
- On-line documentation
- Asset management services
- Calibration services

Integration Services Regardless of your chosen solution, our support personnel are dedicated to solving complex problems with equipment and systems. Using this expertise, in open systems and proven technologies, we can provide you with trouble-free integration of all hardware and software into your existing operations.

Training Specialized training provides your personnel with the required technical and functional knowledge. We provide formal in-house training at our state-of-the-art classroom facilities, mobile training conducted at your location or distance learning courses and materials to suit your specific needs.

Validation and calibration

Endress+Hauser provides regular maintenance, validation and calibration services from in-situ testing through to full, accredited factory calibration for all your process variables.

- Fully accredited
- Flow meters from diameter DN1 up to DN2000
- Pressure instruments from 0.001 mbar to 750 bar/1.45 psi to 10,878 psi.
- Temperature instruments from -20 °C to +1600 °C/-4 °F to +2912 °F
- All services are available for third party instrumentation as well.



Contact us:

www.endress.com/services

www.endress.com/support



www.addresses.endress.com

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