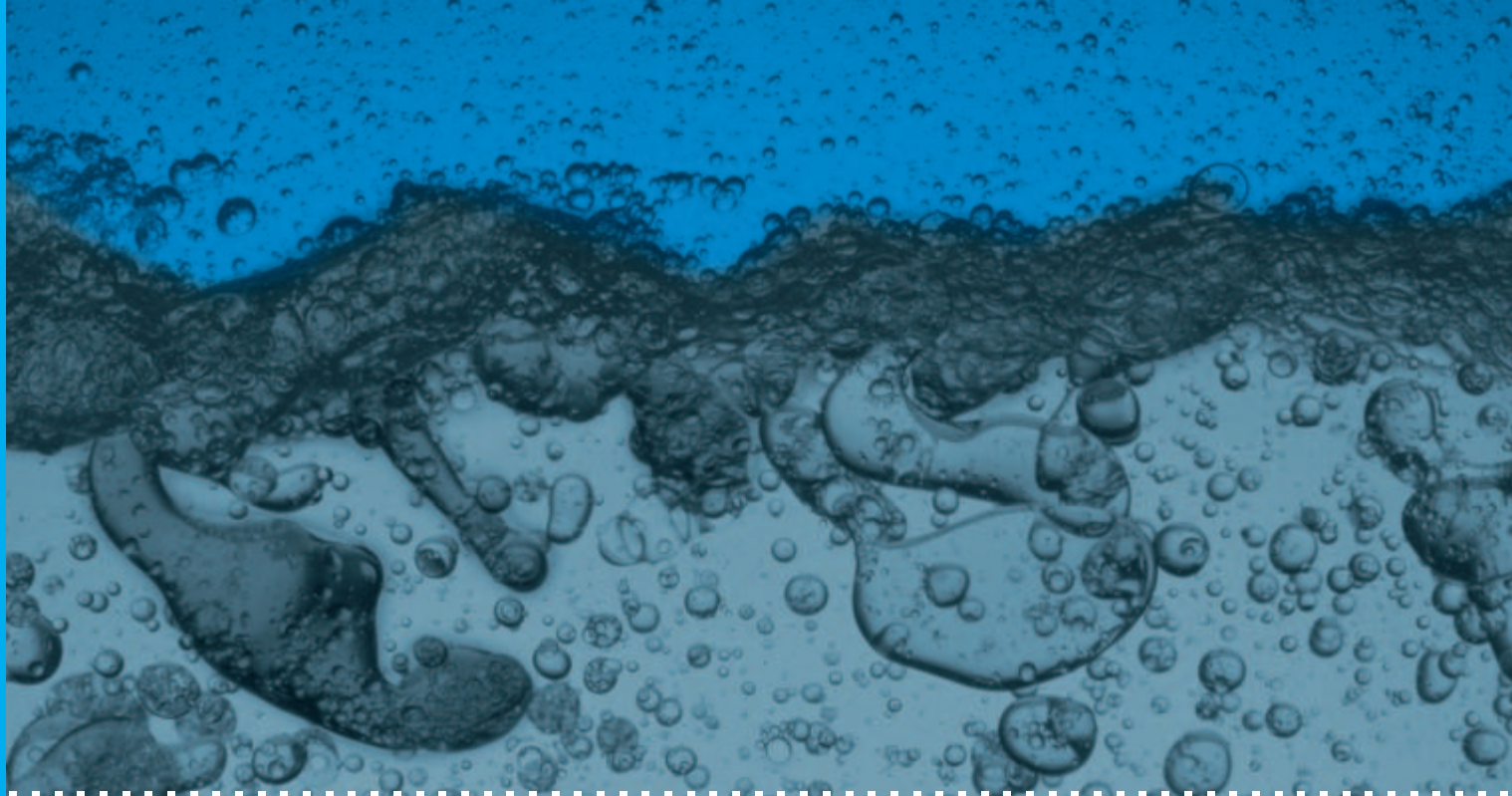


Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Separate the best from the rest

The suitable measuring principle for your individual interface application

- Clear interface in liquids
- Interface with emulsion layer in liquids
- Multiple interfaces between liquids and with solids

Endress+Hauser

People for Process Automation

Liquids, emulsions, solids – challenging

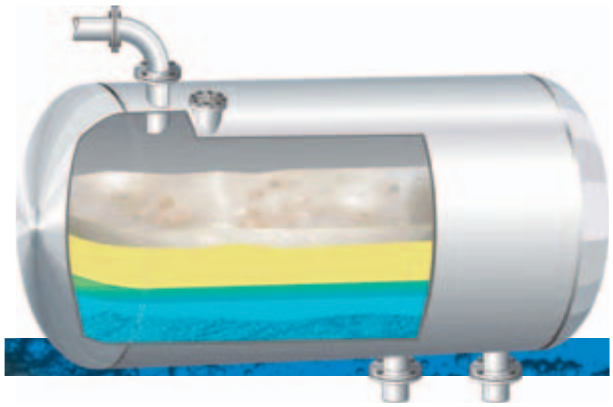
The focus is on your application, the instrument serves the application and is only chosen once the general setting is known.

We provide the optimum interface measurement solution in relation to your process requirements.

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

The answers to these questions are highly relevant for the correct instrument selection.

We offer you transparency in relation to possibilities, physical limitations and commissioning of the individual measuring principles. Guided radar, Multiparameter, capacitance instrumentation or radiometry – we support you in your application.



„Multilayer“ – Complex interfaces, for example in the crude oil extraction process

Interface with emulsion layer in dynamic processes

Clear interface in steady processes

Picture: Guided radar –
Levelflex, for simultaneous measurement
of interface and total level

Picture: SensorFusion –
Levelflex FMP55 Multiparameter, measurement of
interface and total level with emulsion

Guided radar

Functional principle

In guided radar level measurement, high-frequency pulses are coupled to a probe and guided along the probe. The pulses are reflected from the product surface, received by the electronic evaluation unit and converted into level information.

As the high frequency pulses meet the medium surface, only a part of the emitted pulse is reflected. Particularly in case of media with a low upper dielectric constant (DK value), the other part penetrates the medium. At the interface to a second medium with a higher dielectric constant (DK value), 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.

Multiparameter

Functional principle

The Multiparameter FMP55 is the innovation in interface layer measurement. The device combines the advantages of the capacitance and guided radar measuring principles in one instrument – this innovation is called SensorFusion. If emulsion layers occur, measurements with guided radar may cause signal losses in interface layer detection which means that the interface layer signal coincides with the overall level signal. It is only Levelflex FMP55 Multiparameter which guarantees safe measured values both for the interface layer and the overall level by a unique, redundant measuring system.

Picture: Capacitance –
Liquicap, for interface measurement

Picture: Radiometry –
Gammapilot, for a clear picture without medium contact

Capacitance

Functional principle
In capacitance measurement, the probe forms a capacitor together with the tank while the medium in the tank and the probe insulation constitute the dielectric.

Media with a low dielectric constant (DK value) cause very small changes of the capacitance value in level measurement while media with a high DK value produce respectively large capacitance changes. In many interface applications, the medium with the lower DK value is on top, e. g. hydrocarbon 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. In order to make use of this effect, the DK value of the two media must be sufficiently different from each other.

Radiometry

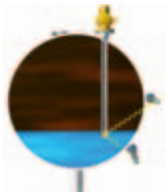
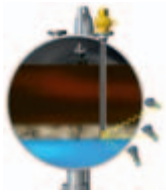
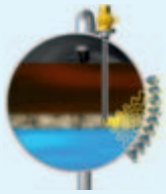
Functional principle
Since the radiometric measuring principle measures in a non-invasive manner, it is suited to all applications in which other methods fail, for example due to extreme process conditions or mechanical, geometric or construction conditions.
The gamma source emits radiation; it is attenuated as it passes through the tank wall and the medium. A detector is mounted on the opposite side of the tank and converts the radiation into an electric signal. The measuring effect results from the absorption of the radiation by the product to be measured.

For interface measurement, the radiation of media with different densities is also differently attenuated. If the transmitter is calibrated to the medium with the lower density using wet calibration and then to the medium with the higher density, a correlation for the measurement of the interface layer automatically results.

The application determines the sensor

	Guided radar
	 Levelflex FMP51/52/54
■ Clear interface liquid / liquid 	**Total level + interface layer**
■ Interface with emulsion layer liquid / liquid 	Not possible
■ Interface with emulsion layer liquid / liquid ■ Interface liquid / solid ■ Multiple layer interface liquid / solid 	Not possible
Features / Advantages	■ Simultaneous acquisition of interface layer and total level ■ Not affected by the density of the medium ■ No wet calibration required ■ Direct replacement of displacers in existing displacer chambers ■ Applications up to 450°C / 400bar (842°F / 5,800psi) ■ Probes can be shortened (rod)
Application limits / Conditions	■ Dielectric constant (DK value) of the upper medium must be determined ■ DK value changes of the upper medium influence accuracy ■ DK value of the upper medium may be max. 10 ■ Difference of the DKs between the two media must be >10 ■ Probe length up to 10m/33ft (larger on request) ■ For interface measurement, the thickness of the upper phase must be min. 60mm/2.36" ■ Emulsion layers up to max. 50mm/1.97" allowable

Our proposal

Multiparameter	Capacitance	Radiometry
 Levelflex FMP55	 Liquicap FMI51/52	 Gammapilot FMG60
Total level + interface layer	**Interface layer**	
Total level + interface layer	**Interface layer**	**Interface layer + emulsion thickness** 
Not possible	Not possible	**Interface-density-profile** 
▪ Simultaneous acquisition of interface layer and overall level, also in case of emulsions ▪ Precise and reliable measurement ▪ Independent of medium density ▪ Wet calibration not required ▪ Applications up to 200°C (392°F) ▪ PTFE-coated probe	▪ 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 ▪ Extremely fast response time ▪ Applications up to 200°C / 100bar (392°F / 1,450psi)	▪ Non-invasive and maintenance-free measuring method ▪ Unaffected by pressure and temperature ▪ Only slight influence by build-up ▪ Unproblematic use in emulsion layers ▪ Solutions for multiphase measurements using several detectors
▪ Dielectric constant (DK value) of the upper medium must be determined ▪ 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 ▪ Probe length up to 10m/33ft (larger upon request) ▪ For interface layer measurement, the thickness of the upper phase must be minimum 60mm/2.36" ▪ Conductivity of the upper medium: <1µS/cm Conductivity of the lower medium: >100µS/cm	▪ Difference of the dielectric constant (DK value) between the two media must be >10. The upper medium may not be conductive ▪ Accuracy impairment in case of nonconductive buildup on the probe ▪ The smaller the vessel the higher the influence of DK changes in the upper medium ▪ The bigger the quotient DK(below) / DK(above) the better the accuracy ▪ The total level is not measured ▪ Probe length up to 10m/33ft ▪ Conductivity of the upper medium: <1µS/cm Conductivity of the lower medium: >100µS/cm	▪ Medium density changes influence the accuracy ▪ The overall level is not measured (possible with a further source and detector) ▪ Calibration with the medium is required ▪ Radiation Protection Law

The right solution for any interface layer

Endress+Hauser is the world market leader in level instrumentation and has the experience of many years at its disposal – from planning and commissioning as well as maintenance through to plant management – we are the right partner for you.

To optimize your operating costs, Endress+Hauser offers instrumentation with low maintenance work – as compared to mechanical systems – and a suitable solution for any interface layer application.

- **Guided radar** – for the simultaneous issue of interface layer and overall level
- **Multiparameter** – for measurements in emulsion layers with the simultaneous, safe acquisition of level and interface layer signals
- **Capacitance probes** – a tried and tested principle for interface layer measurement
- **Radiometry** – if robust non-contact measurement is required

Make use of our tools for measuring point selection during the design phase and be convinced of simple, menu-guided commissioning on site or at the control room.

Levelflex, Levelflex Multiparameter, Liquicap and Gammapilot – your quartet for interface layer measurement.

12.06/I.I.

Instruments International

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland
Tel. +41 61 715 81 00
Fax +41 61 715 25 00
http://www.endress.com
info@ii.endress.com

CP 00035F/00/EN/13.11
71141162
HD/INDD CS2

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