

Levelflex FMP5x and Micropilot FMR5x

Next Level Instrumentation



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Benefits from platform concept

“Uniform device concepts across measurement parameters create invaluable advantages.”

The family is growing...



Promass E 200



Levelflex FMP5x

Release 2010



Prosonic Flow B 200

Release: 12.2011



Promass F 200

Release: 07.2012



Promag P/H 200

Release: 08.2012



Micropilot FMR5x

Release: 12.2012

Overview about the new 2-wire Platform

Housing



Plastic



Alu



316L

Display



mechanical buttons or optical buttons for operation from outside



Remote Display FHX50

Approval



ATEX



Electronics + HistoROM



4-20mA
-

2-wire



4-20mA
+ Status



4-20mA
4-20mA

4-wire



4-20mA
DC



4-20mA
AC



PA +
Status



FF +
Status

Sensors

Promass
E 200/F 200



Prosonic Flow
B 200



Promag
P 200



Levelflex
FMP5x

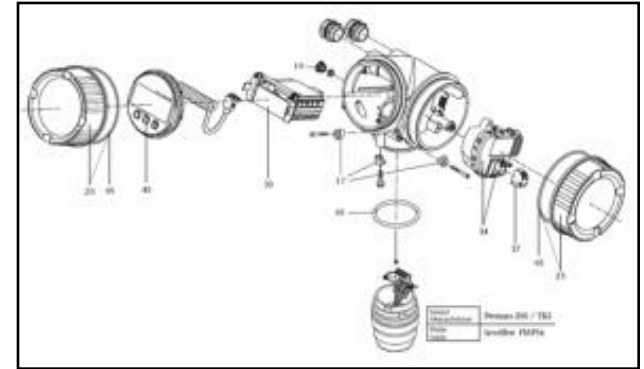


Micropilot
FMR5x



Identical Accessories and Spare Parts for Flow and Level



- Reduce stock keeping expenses due to platform spare part strategy



Cover	Order Number	Original Spare Part Set	Usage
	71110281	Cover GT18 316L, gasket	Levelflex FMP5x, Promass TB2
	71110293	Cover GT19 PBT, gasket	Levelflex FMP5x
	71110299	Cover GT20 alu, gasket	Levelflex FMP5x, Promass TB2
	71110282	Cover GT18 316L, sight glass, gasket	Levelflex FMP5x, Promass TB2
	71110292	Cover GT19 PBT, sight glass, gasket	Levelflex FMP5x
	71110297	Cover GT20 alu, sight glass, gasket	Levelflex FMP5x, Promass TB2



Innovative display modules

Displays	SD02	SD03 <small>(Feb. 2013)</small>
<p>Picture</p>		
<p>Feature</p>	<ul style="list-style-type: none"> • Mechanical push buttons • HistoROM concept: Backup and copy of transmitter data • IP20/NEMA1 mounted in the housing (without cover) 	<ul style="list-style-type: none"> • Touch control (IR) • HistoROM concept: Backup and copy of transmitter data • Backlight of display included • Backlight with <ul style="list-style-type: none"> • White color • Red color for alarm

Remote display housing FHX50

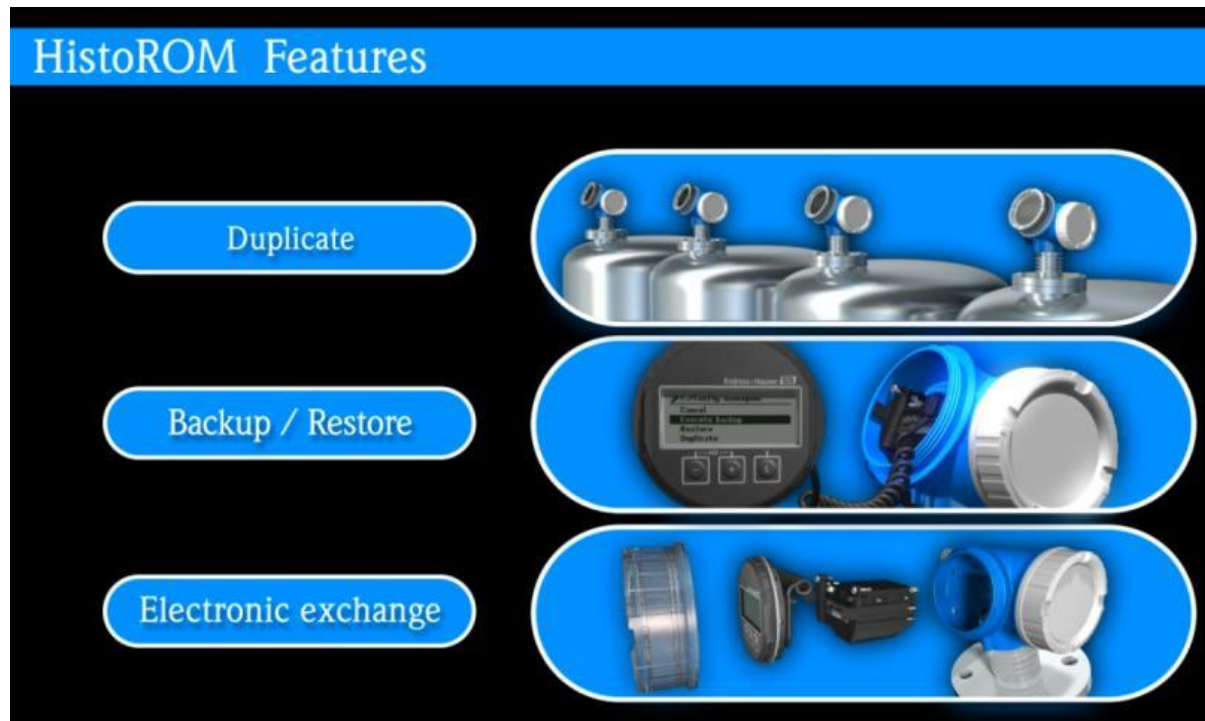


- Two housing types:
 - Plastic (PBT)
 - Stainless steel (316L) (in prep.)
- Suitable for both displays:
 - Push button operation (SD02)
 - Touch control operation from outside (SD03)
- Device FMP/FMR5x must be ordered with option prepared for display FHX50:
 - Two options:
 - With M12 plug at the device (max length: 30m)
 - Customer standard cable for own installation (up to 60m installation length)

HistoROM

HistoROM Features

- Duplicate
- Backup / Restore
- Electronic exchange





HistoROM

- **Functions HistoROM:**

- Storage of device parameters
- Storage of event log book (basic: 20 events)
- Together with on-site display:
 - Backup of device settings in the display
 - Restore of device settings from display backup file
 - Import settings from device 1 to device 2 (e.g. same tank, same installation, same settings)



- **Benefit:**

- Easy electronic exchange
 - No need of SW – tooling or new setup to start measurement, only a screw driver is necessary
- History information for diagnostic purposes
- Safety for configuration data without a SW–tooling, time saving full restore and backup
- Time saving setup of tank farms with import of settings from device to device

HistoROM

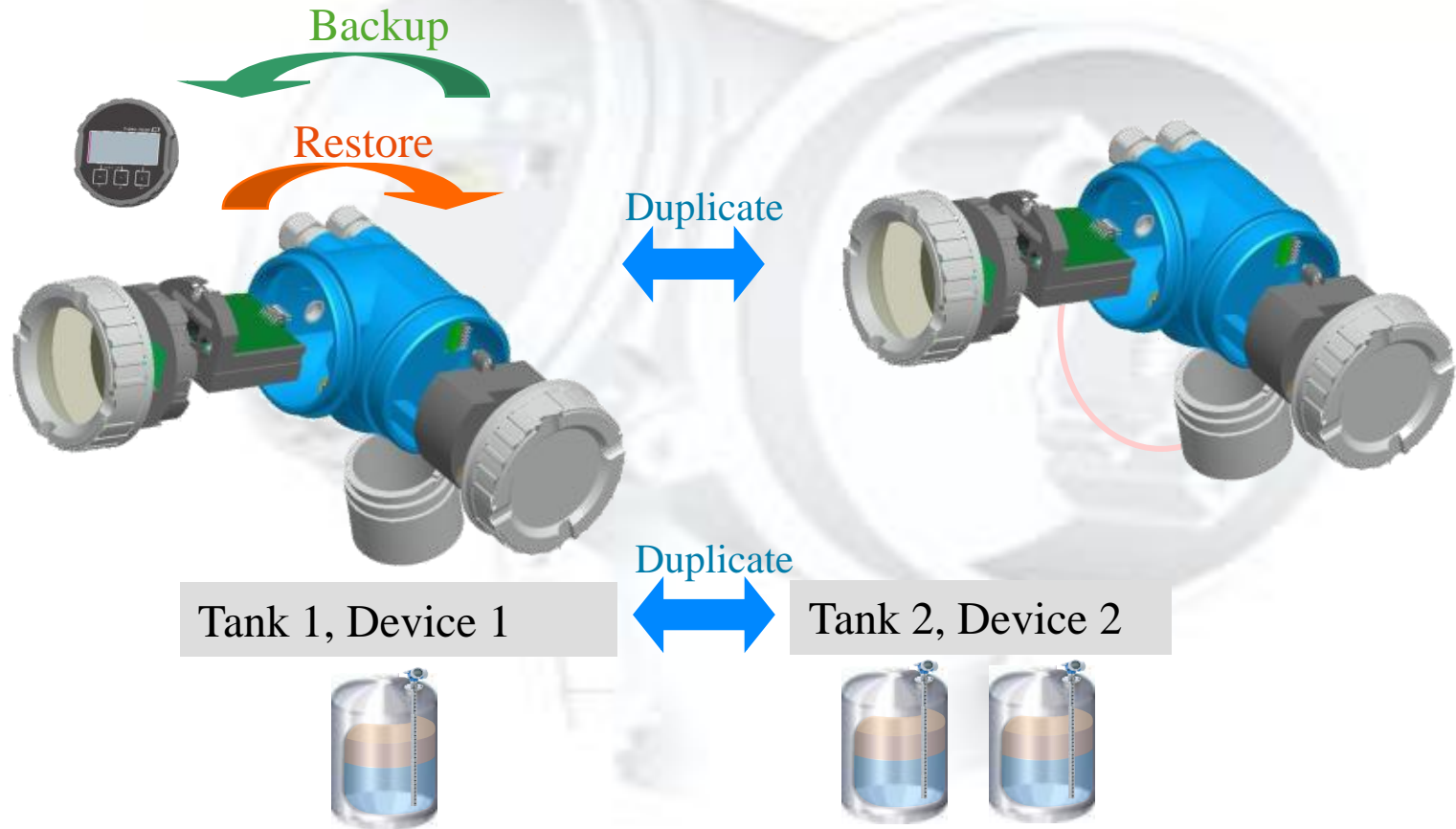
Example HistoROM functionality



HistoROM

Backup functionality: **BACKUP** / **RESTORE** / **DUPLICATE**

In combination with on-site display



HistoROM – savings while commissioning

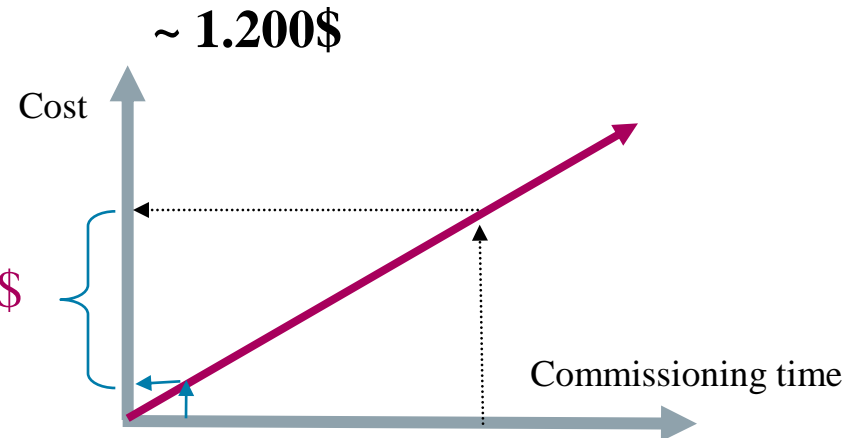
Benefit:

- No software tools required → 20 min/measuring point
- Time saving set up of tank farms → 15 min/measuring point
- For e.g. commissioning 40 tanks with SW tool = 800 min (100\$/h) → > 1.300\$
- Commissioning time with display + copy function = 1h (100\$/h) → 100\$

Savings



Savings > 1.200\$



Diagnostics

Namur NE 107

Additional Process Information/Predictive Maintenance



“Tell me what to do” diagnostics symbols recommended by NAMUR NE107

- 1 Diagnostics:
icons + text



- 3 Clear text information
maintenance instructions



- 2 Measurement view
clear failure signals



- 4 Events storage
on DAT (SD) card



Easy + open system integration

Different systems and different technologies are supported for an easy and self explaining integration.



Diagnostic information



The screenshot displays the SIMATIC PDM software interface. The main window shows a table of parameters for 'Levelflex 5x'. A callout bubble points to the 'Detailed diagnostic information' section of the table.

Parameter	Value	Unit	Status
Levelflex 5x			
TAG			
PDM User Level	Operator		

A 'Diagnostics' dialog box is open, showing the status 'Out of specification (8)' and a timestamp '11d08h56m00s'. Below this, the 'Actual diagnostics' section shows '6441 Current output @1'. A 'Remedy information' dialog box is also open, displaying the following steps:

1. Check process
2. Check current output settings

The 'Remedy information' dialog box includes 'OK', 'Cancel', and 'Help' buttons. At the bottom of the screenshot, there is an image of a blue industrial connector with a white label '1' and a black cable.

Diagnostic information

04/30/2010 14:28:25.523 [FMP5x Rev. 0]

File Actions Help

Configure/Setup

- Display/operat.
- Setup
 - Setup
 - Advanced setup
 - Advanced setup
 - Level
 - Linearization
 - Edit Table
 - Safety sett.
 - Prob.length corr
 - Curr.output 1
 - Display
 - Conf.backup disp
 - Diagnostics
 - Diagnostics**
 - Diagnose list
 - Event logbook
 - Display event buffer
 - Device info
 - Measured val.
 - Simulation
 - Device check

Device Diagnostics

Process Variables

Diagnostics

PMP5x

Status: Out of spec. (S) Timestamp: 11d06h17m48s

Actual diagnos.: S441 Current output @1

Remedy info.

Timestamp: 11d06h17m48s

Prev diagnostics: F435 Linearization

Timestamp: 11d06h22m11s

Time fr. restart: 0d20h09m31s

Operating time: 11d08h35m19s

Endress+Hauser





Help & trouble shooting info online

Time: Current

OK Cancel Apply Help

Clear device- and process diagnostic

- ✓According NAMUR NE107
- ✓Unified and categorized information

C		Function <u>C</u>heck
M		<u>M</u>aintenance required
F		<u>F</u>ailure
S		Out of <u>S</u>pecification



Enhanced and easy diagnostic functionality

- The new categorizing in **Failure, Function check, Out of specification** and **Maintenance required** (NAMUR NE107) shows directly to the operator what he has to do e.g.:
 - Failure [**F**] → change to manual operation and call maintenance technician immediately
 - Function check [**C**] → configuration in progress
 - Out of specification [**S**] → check process environment
 - Maintenance [**M**] required → call maintenance technician or add the request to the maintenance schedule
- The detailed diagnostic information shows ...
 - ... what happened
 - ... remedy information.



SIL IEC 61508



First Radar Devices developed acc. to IEC 61508

- The new ToF Series FMR/FMP5x are **the world's first ToF devices** which has been developed according to **IEC 61508:2010** (Edition 2.0)
- All FMR/FMP5x are suitable for the use in safety-loops (**MIN, MAX and RANGE**) with all 4...20mA HART® options, up to
 - **SIL3** (in homogenous redundancy)
 - **SIL2** (as a single device)
- For test sequence C (simulation) it is **not necessary to interrupted or manipulated the production process and can be done easily from control room** (Communication between device and DTM is secured)
- Development supported by certified TÜV Functional Safety Engineers and TÜV Functional Safety Expert
- **Independent Functional Safety Assessment and certification by accredited body** (TÜV Rheinland)





Developed according IEC 61508

Continuous automatic internal check in the device



- Logic program run control
- Reference pulse HF
- Quartz synchronization
- Measuring cycle time
- Supply voltage
- Temperature
- Check sum RAM
- Cable breakage

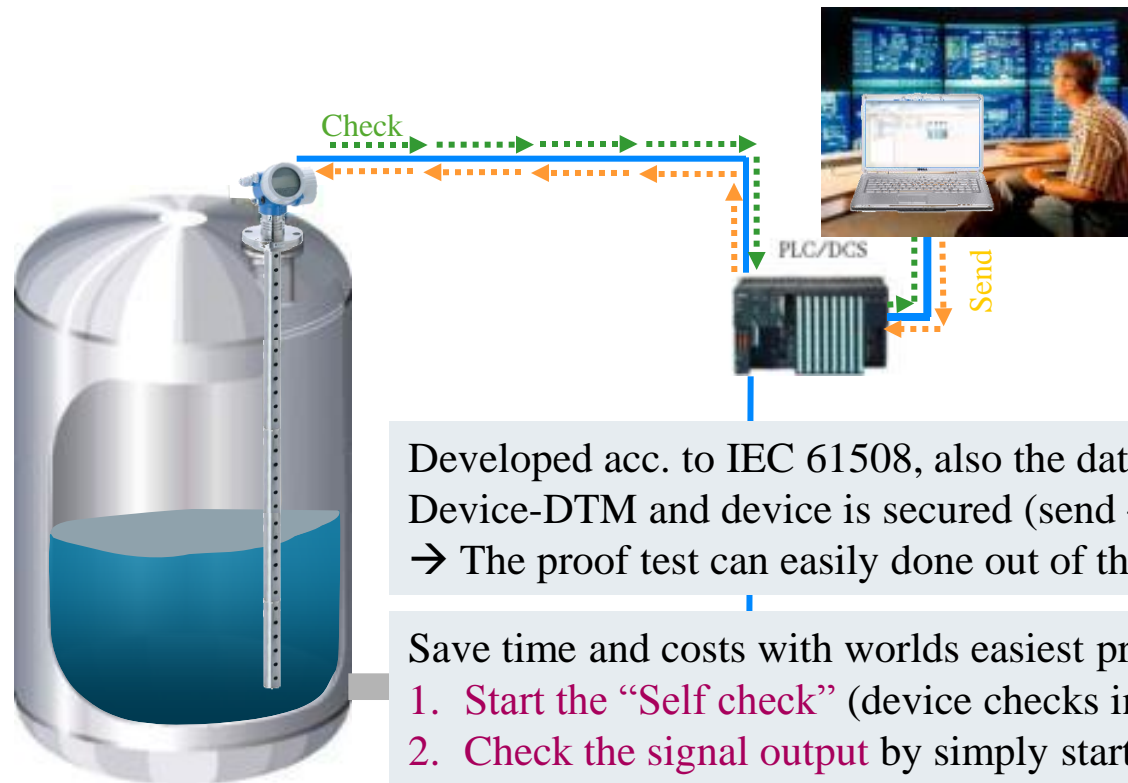
Check



- Continuous self-monitoring to check the correct functionality of the device
- More than **80 diagnostic measures** and techniques **permanently running** in the background

Proof test from control room

Proof procedure via manual started self check (proof test)



Developed acc. to IEC 61508, also the data communication between Device-DTM and device is secured (send – check).
→ The proof test can easily done out of the control room

Save time and costs with worlds easiest proof test for SIL/WHG

1. Start the “Self check” (device checks internal communication path)
2. Check the signal output by simply starting the simulation

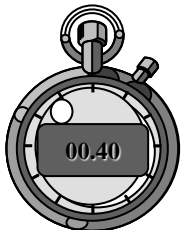
Proof test is done without interruption of the process!

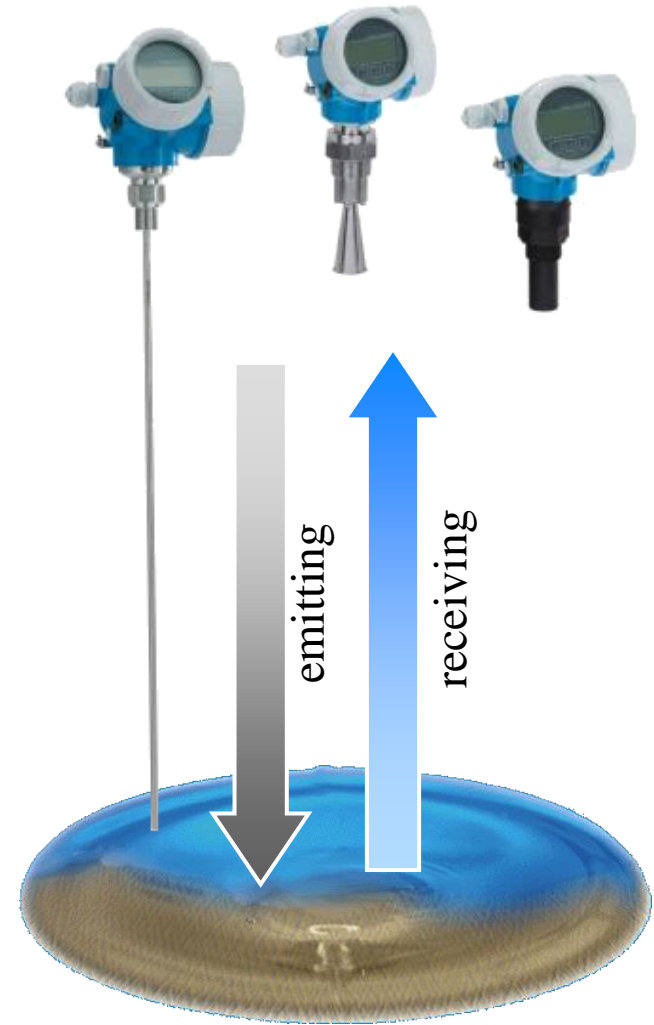
NEXT LEVEL



The Principle – Time of Flight (ToF)

- Emission of ultrasound- or microwave-pulses
- Reflection of the pulses from the product surface
- Receiving of the reflected pulses
- Measurement of the **Time of Flight** calculation of the distance between the device and the product surface by

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




External Influences on Microwaves



Independent of:

- Gas composition
- Vacuum
- High Temperatures
- Alternate pressures
- Changing density
- Air turbulence

Physical Effect on the Propagation of Microwaves

Speed of light in various media		
Medium	ϵ_r	μ_r
Air	1,000594	1,000000
CO ₂	1,000985	1,000000
O ₂	1,000486	1,000002
N ₂	1,000528	1,000000
SO ₂	1,009900	0,999991

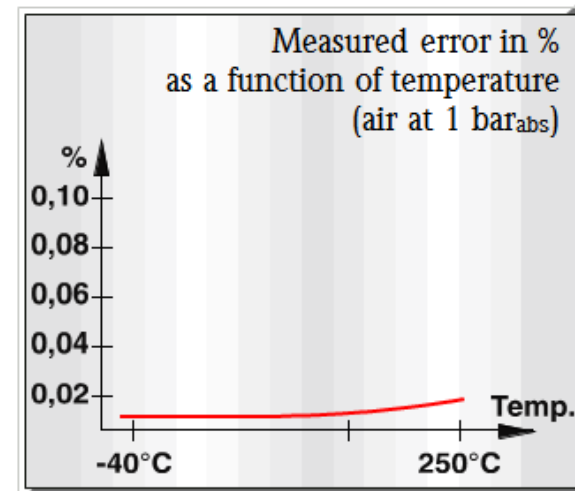
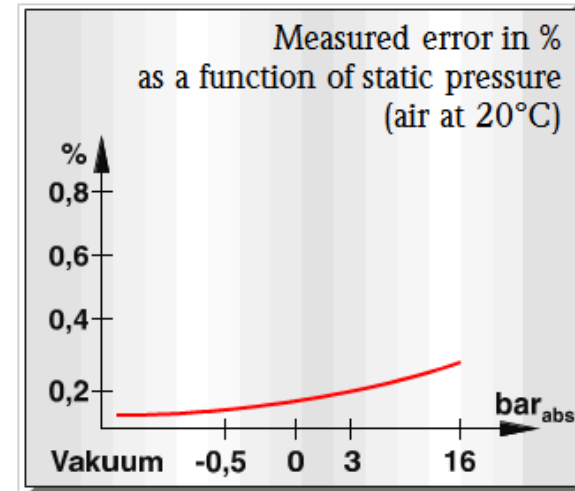
$$V = C' = \frac{C_0}{\sqrt{\epsilon_r} \cdot \sqrt{\mu_r}}$$

ϵ_r = relative dielectric constant

μ_r = relative permeability

C_0 = speed of light in vacuum

C' = speed of propagation in a medium



Microwaves – Effects on Humans



$\sim 5 \text{ mW/cm}^2$
outside



$\sim 0,1 \text{ mW/cm}^2$

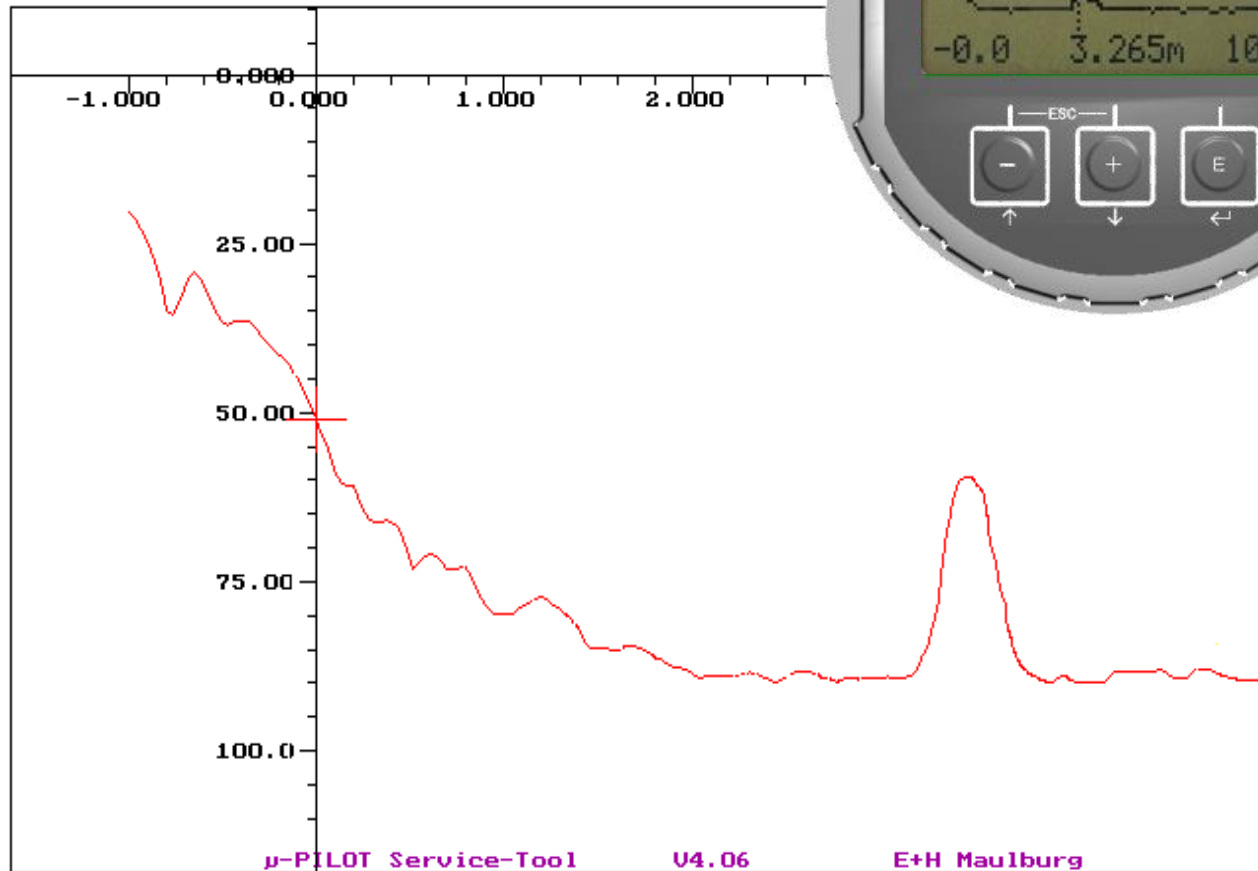


$\sim 0,00021 \text{ mW/cm}^2$



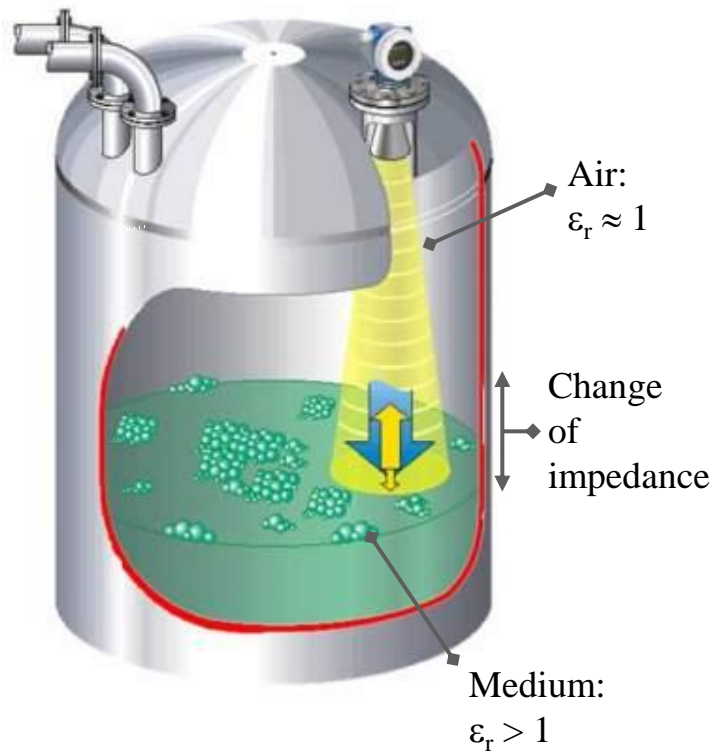
Micropilot M

Envelope curve



Basics Reflection

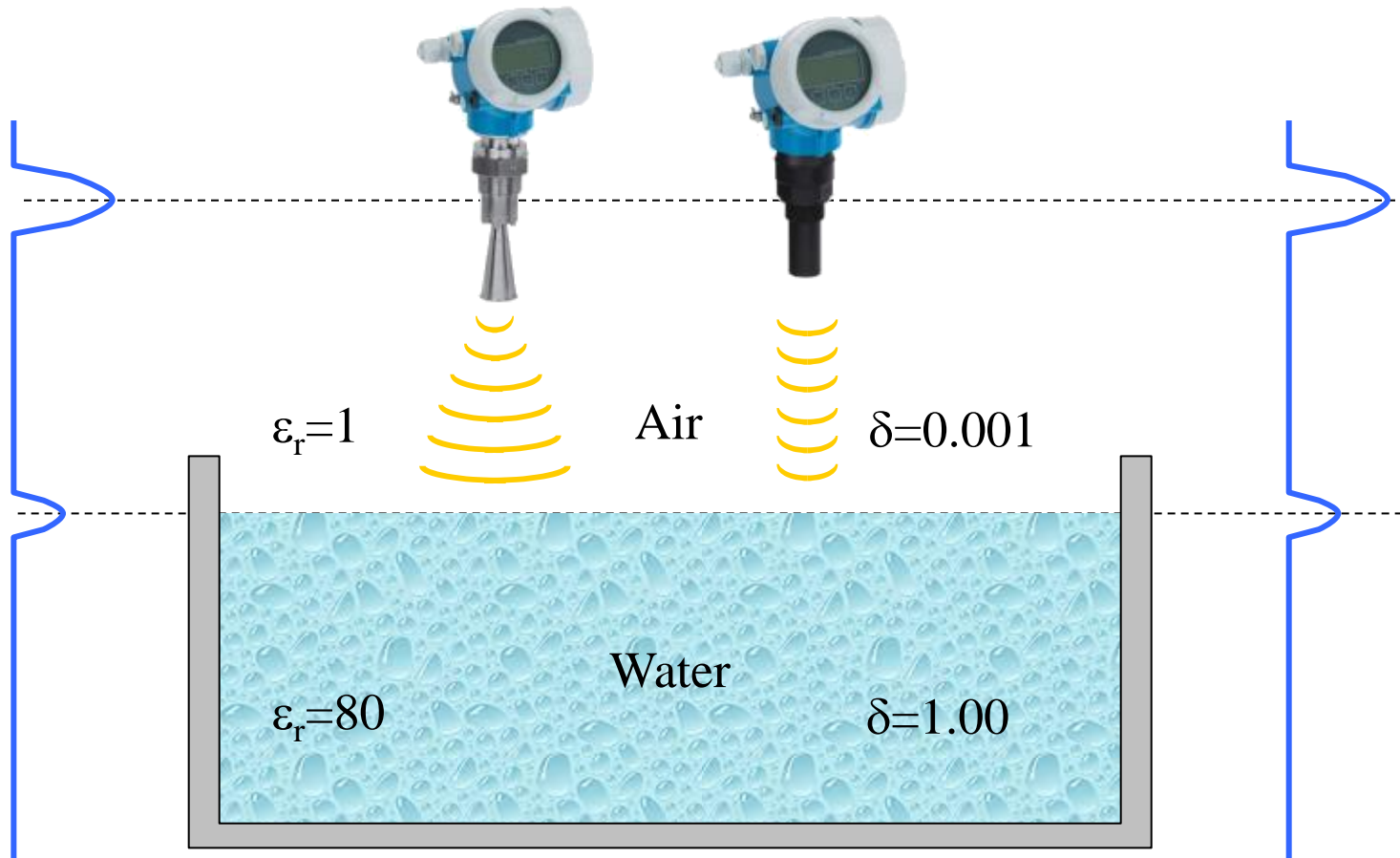
Difference between electromagnetic and mechanical waves



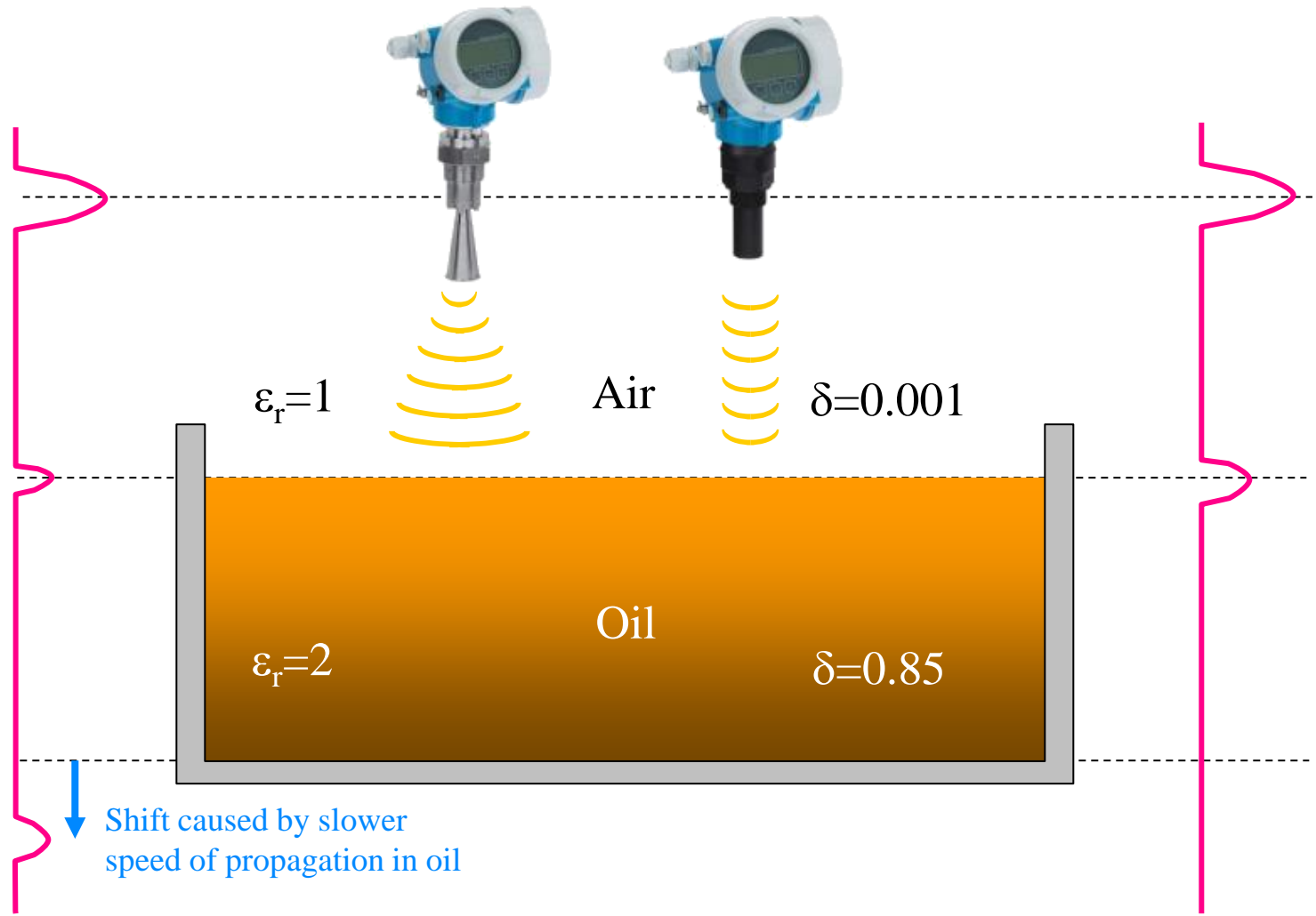
- Ultrasound waves are mechanical waves
- Reflection of ultrasound waves depends on a change of the wave impedance
--> Change of density
- Microwaves are electromagnetic waves
- Reflection of microwaves depends on a change of the wave impedance
--> Change of dielectric constant (DK, ϵ_r)

Basics Reflection

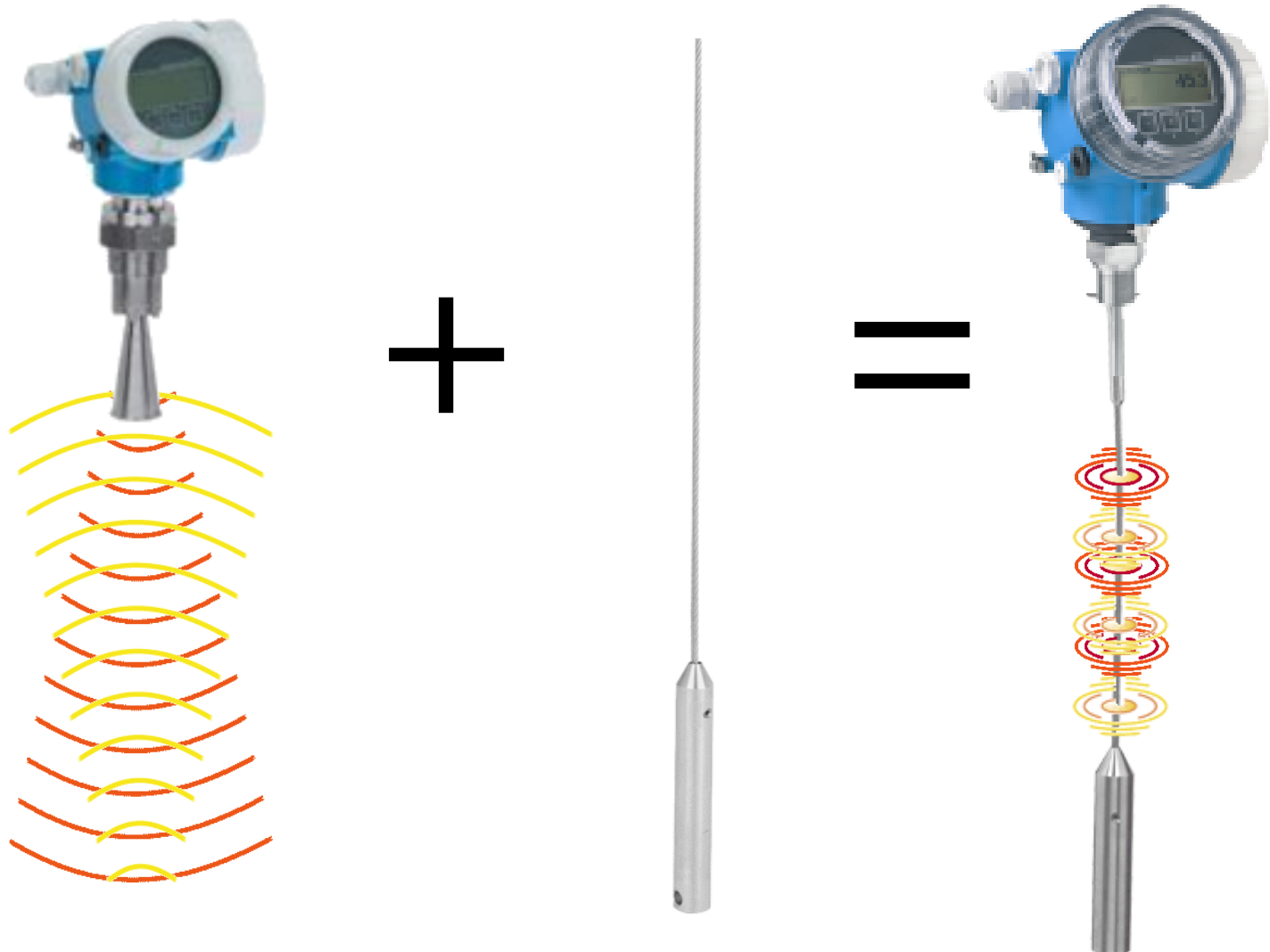
Radar in comparison to Ultrasonic



Basics Reflection



Guided Radar Puls



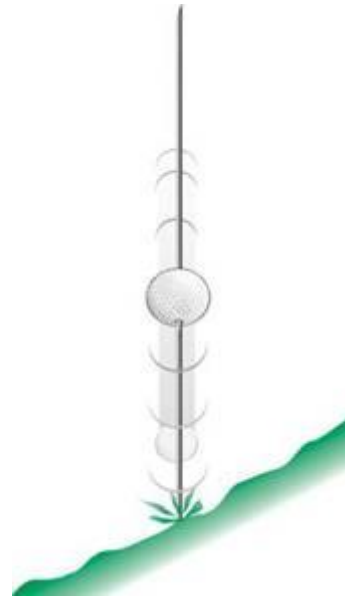
Surface Reflection - Levelflex Evolution

free emitting



Mirror reflection
at smooth surface

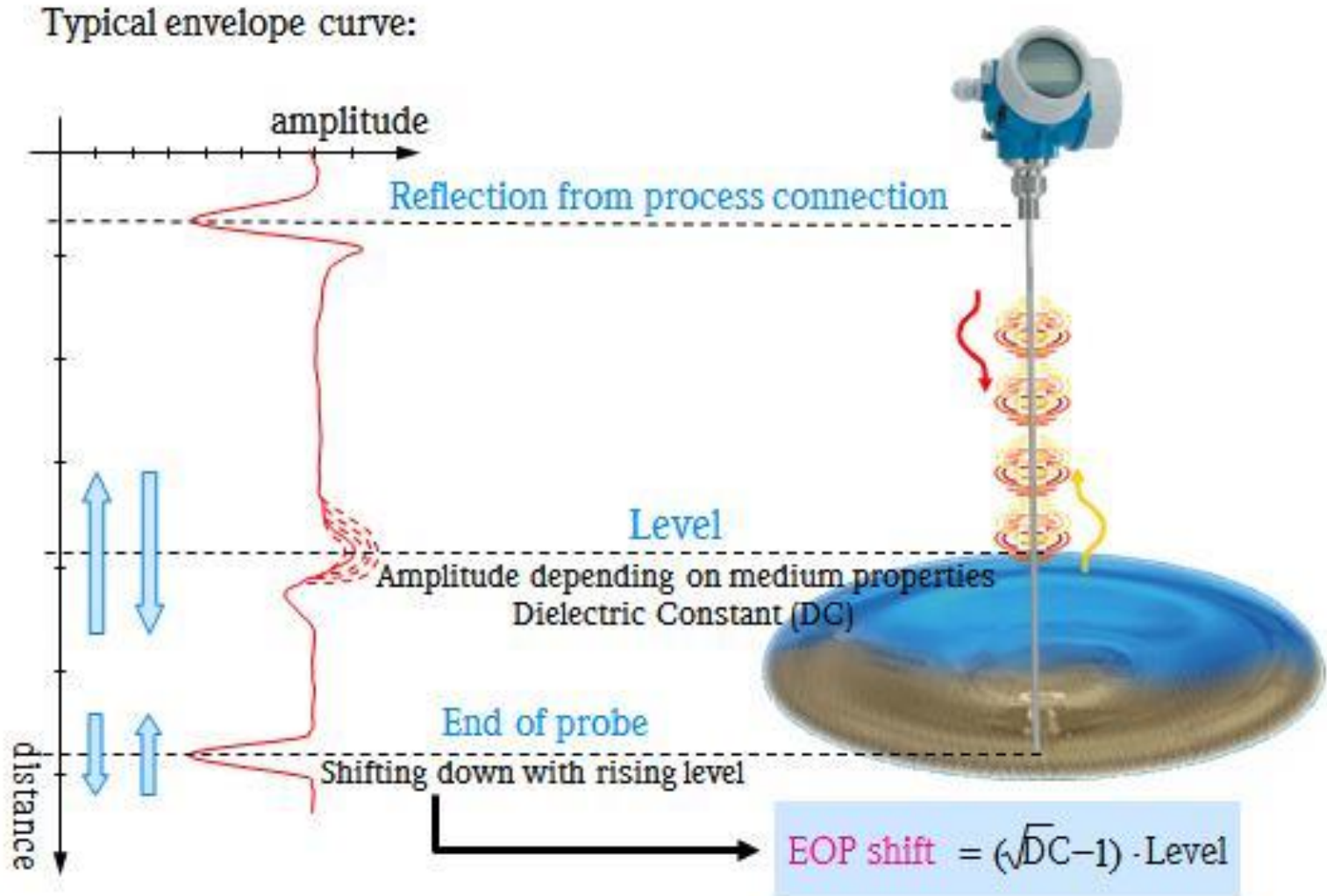
guided



guided reflection
Independent from
surface roughness

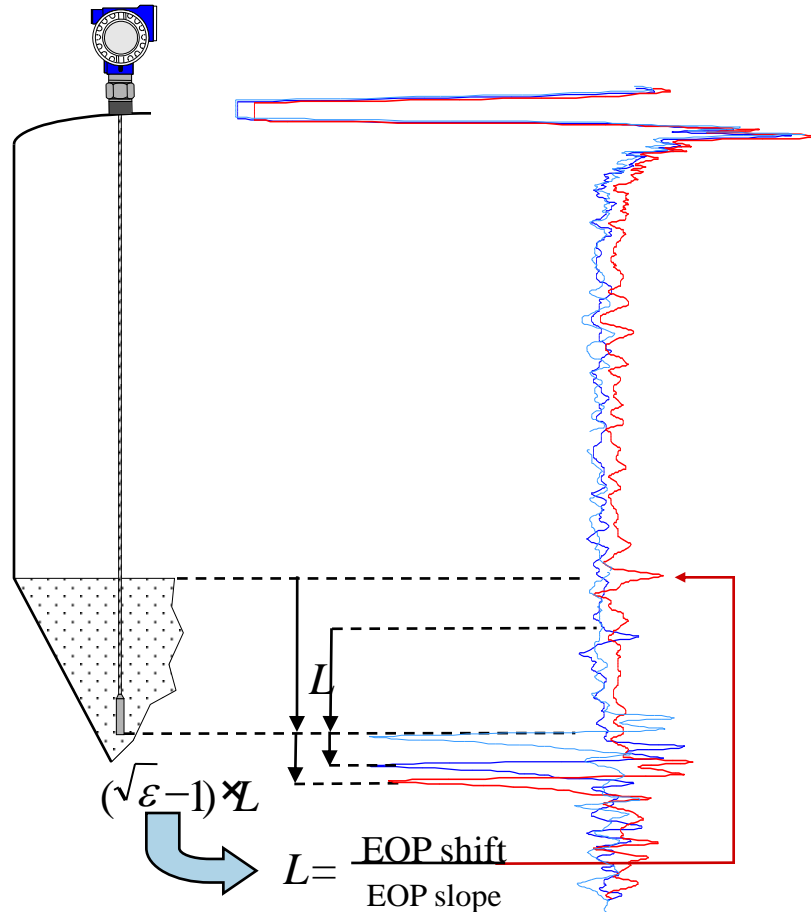


Signal Evaluation



"EOP" Software Evaluation: "End Of Probe" Signal

No lost echo – Unique in the Market!



- automatic calibration, when probe end signal and echo are seen simultaneously
- interpolation of the level information with the probe end signal, when the echo vanishes

$$\text{Level} = \text{EOP shift} : \text{EOP slope}$$

Levelflex FMP5x

Overview



The Next Level Instrumentation - Overview

Today

FMP40



FMP41C



FMP43



FMP45



FMP40



Tomorrow

NEW



NEW



FMP50

FMP51

FMP52

FMP53

FMP54

FMP55

FMP56

FMP57

Levellflex Overview

Housing



Display



Approval



Electronics + HistoROM

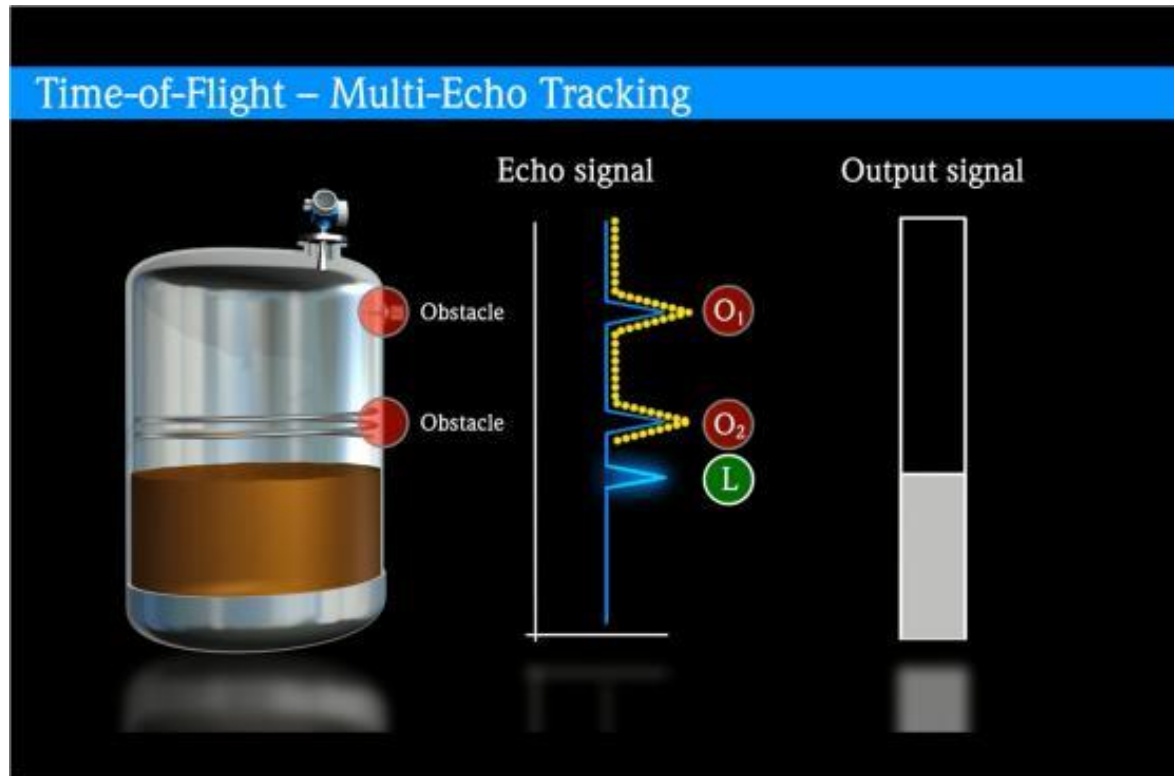


Sensors



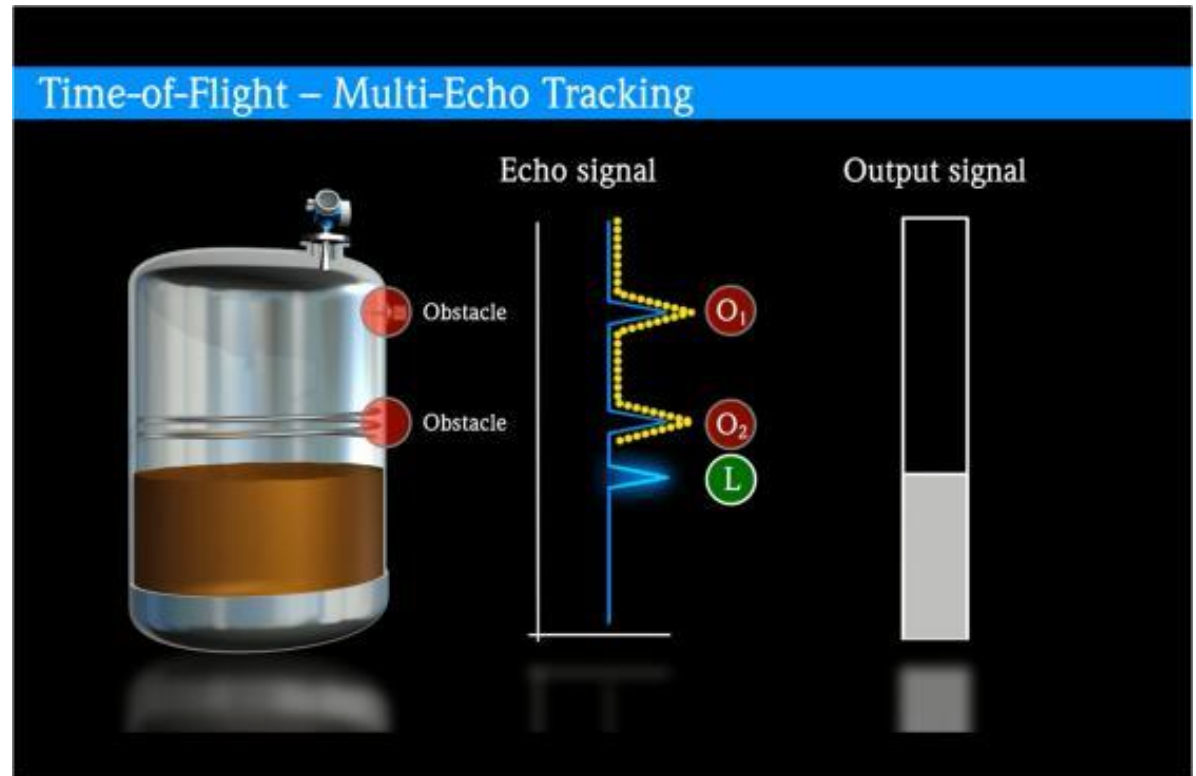
Multi-Echo-Tracking

New Dynamic Signal evaluation



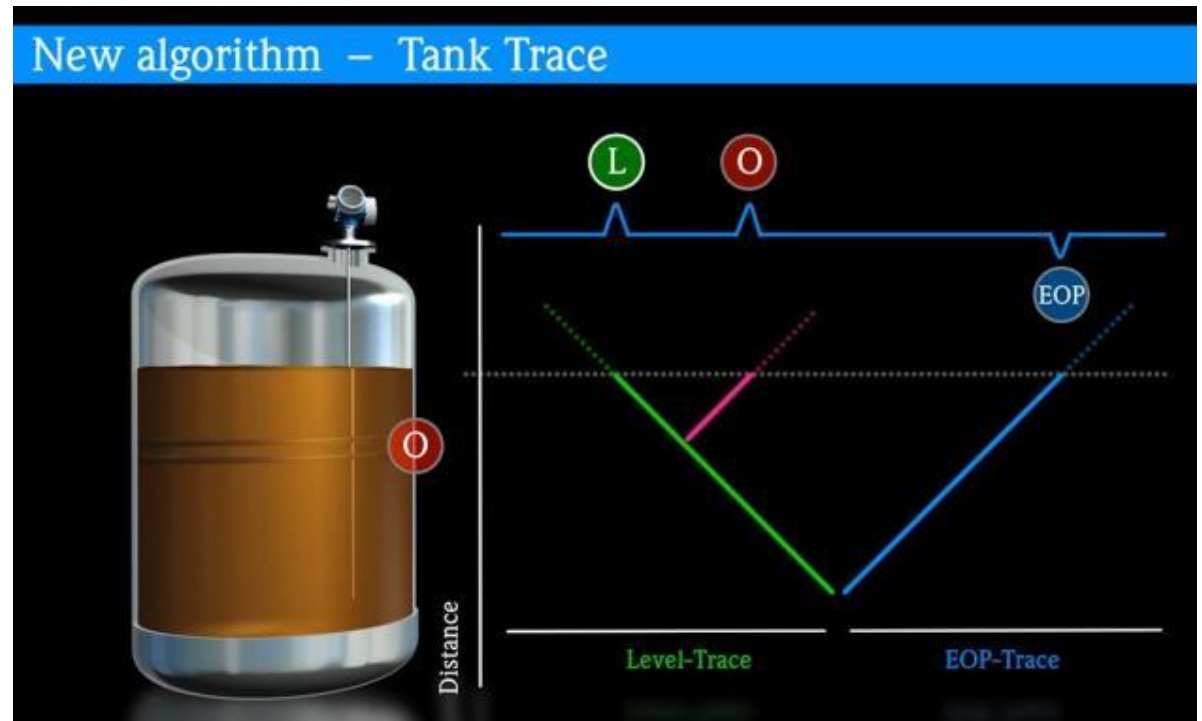
Multi-Echo Tracking

Animation to describe the Multi-Echo Tracking (explained on a Micropilot)



Animation Tank Trace for Micropilot + Levelflex

Tank Trace -> Multi-Echo Tracking for experienced audience (explained on a Levelflex)





Multi-Echo Tracking – savings while operation

Benefit:

Highest measurement reliability leads to stable process without plant downtimes

→ Plant availability

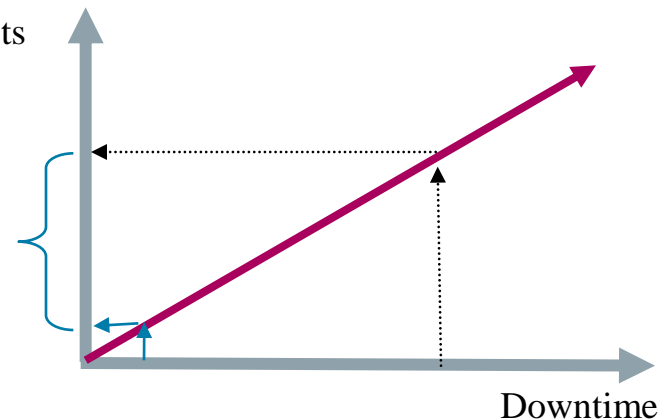
1h of production generates products with a value of e.g. 5.000\$ (depending on product)

→ 120.000\$/day



Plant availability
120.000\$/day
dep. on product

Downtime costs

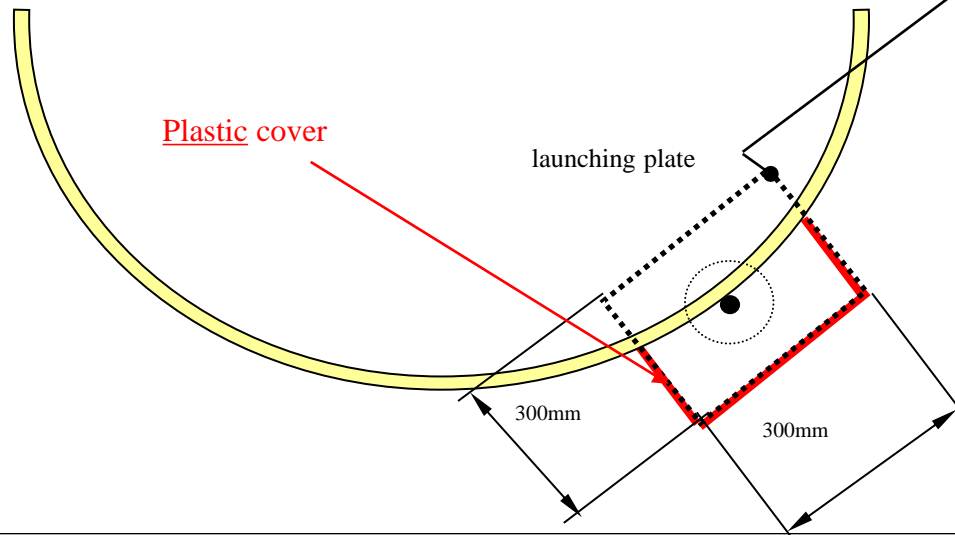


TDR – Measurement from outside

Measurement from outside with Levelflex M FMP 40:

- Neutralisation tank
- Media: varying acids and bases
- Tank material PP, tank wall thickness appr. 2 cm
- „Launchingplate“ 300 mm x 300 mm

Top view:

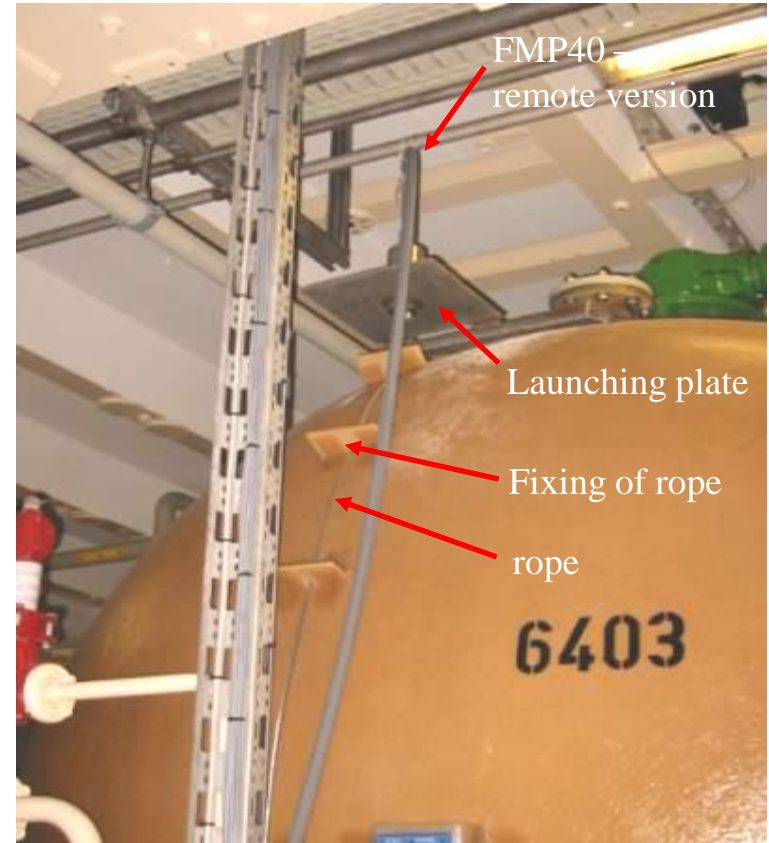


Fa. Würth, Neutralisationsbecken

FMP 40 – Measurement from outside

Application example: measurement from outside on a horizontal vessel

- What kind of problems may occur with this installation?
- How to optimize it?



TDR – Measurement from outside

Application example: measurement from outside on a horizontal plastic vessel (glass fibre reinforced):

- fixing the rope at another place avoids disturbing echos from pipes and cable channel
- because of the special tank shape an additional linearisation is recommended to reach good accuracy
- Install protection against contact



Levellflex – The better “displacer”



Complete measuring point,
bypass for level measurement

Your one-stop shop – Cost savings that do the talking!



Continuous level measurement

Guided radar, Levelflex

Diverse-redundant level measurement

Guided radar, Levelflex with magnetic roller indicator

Interface measurement

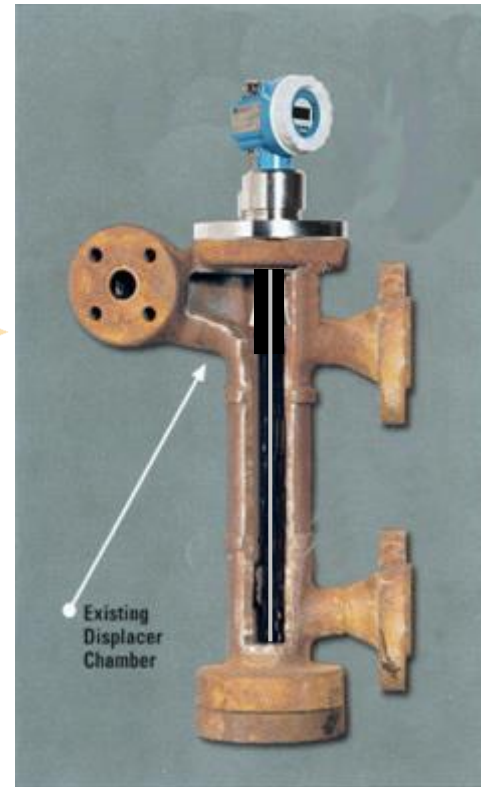
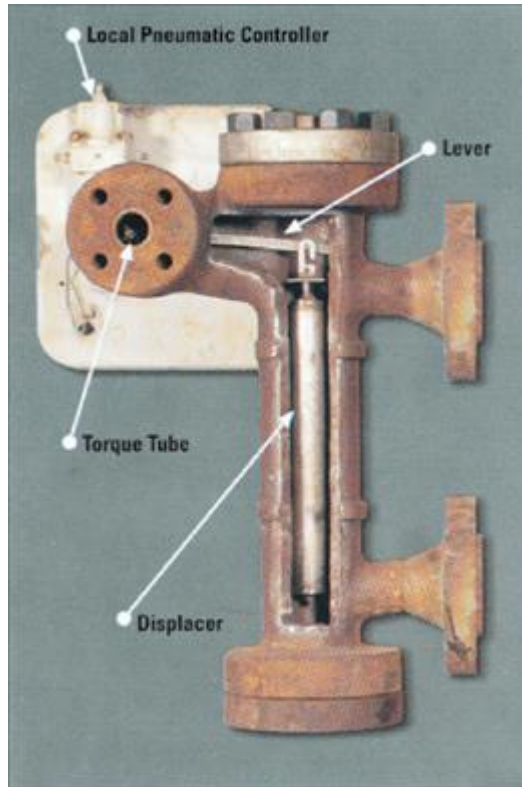
Liquicap M capacitance probe, Levelflex guided radar

Limit detection

Liquiphant M/S vibration limit switch

Endress+Hauser 
People for Process Automation

Displacer Replacement



Displacer are extremely affected by vibration due to the big displacement body over the whole measurement range and due to the small mechanical movement of the torque tube

Levelflex – The better “displacer” (1/3)

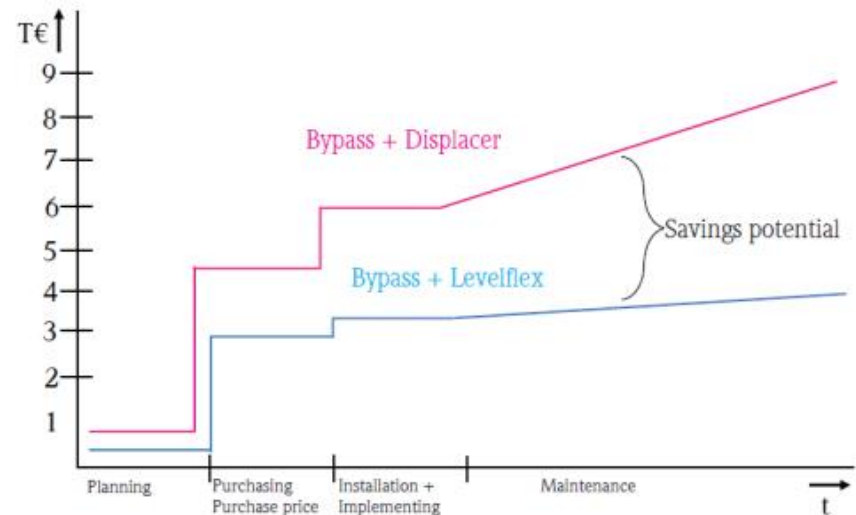
- While engineering a level application the density of the media is often not known exactly (varying process conditions can cause density changes)
 - Wrong level indication can influence the product quality and the plant availability
- The Levelflex is independent on physical media effects (e.g. density, gas phase,...)
- Added values
 - Fast and easy selection → Time saving
 - Reliable measurement → Highest plant availability



Levelflex – The better “displacer” (2/3)

- Bypass vessels (DN 100) are typically used in displacer systems. The Levelflex can be used 1:1 in such bypasses.
- Potential cost savings are even higher for new plants, or when modernizing existing plants, as this technology also works in DN 50 bypass vessels.
- The procurement of high-quality steel bypasses alone involves a cost reduction of approx. 25 %.

Operating costs in comparison to a standard application



Complete Bypass Solutions by E+H

Previous projects –
miscellaneous types



Complete Bypass Solution



- No upper blocking distance.
- Independent of density changes.
- Less influence by buildup.
- Independent of foam.
- Less influence by corrosion.
- No moving parts.
- Independent of vibration.

Information brochure

Level Pressure Flow Temperature Liquid Analysis Registration System Components Services Solutions

**Complete measuring point,
bypass for level measurement**

Your one-stop shop – Cost savings that do the talking!

Continuous level measurement
Guided radar, Levelflex

Diverse-redundant level measurement
Guided radar, Levelflex with magnetic roller indicator

Interface measurement
Liquicap M capacitance probe, Levelflex guided radar

Limit detection
Liquiphant M/S vibration limit switch

Endress+Hauser **EH**
People for Process Automation

Sinopec's Jinan Refinery, China



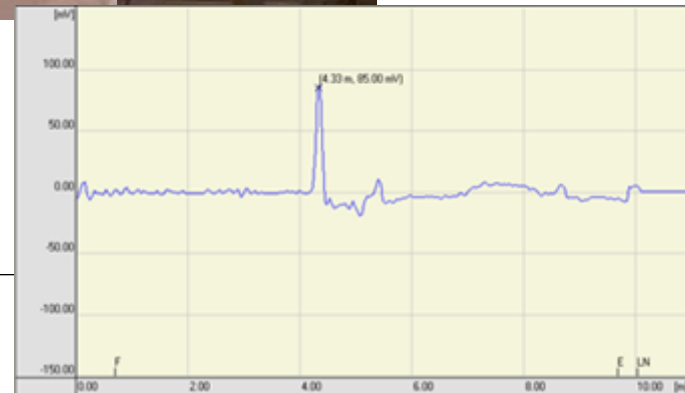
Levelflex-FMP 40

Application:

- LPG Tank
- Propylene C_3H_6
- DC 1.8
- Pressure 16 bar
- Bypass 10 m

Instrument:

- FMP 40 Rod version
- 3x 3.3 m divisible rod



Flaga Gas : 4 x LPG bullets Tanks (Czech Republic)



Level measurement :

FMP40-1LL2YY9B21AA

L=3884 mm

YY9 = DN50 DIN2512 F MVTFN0032

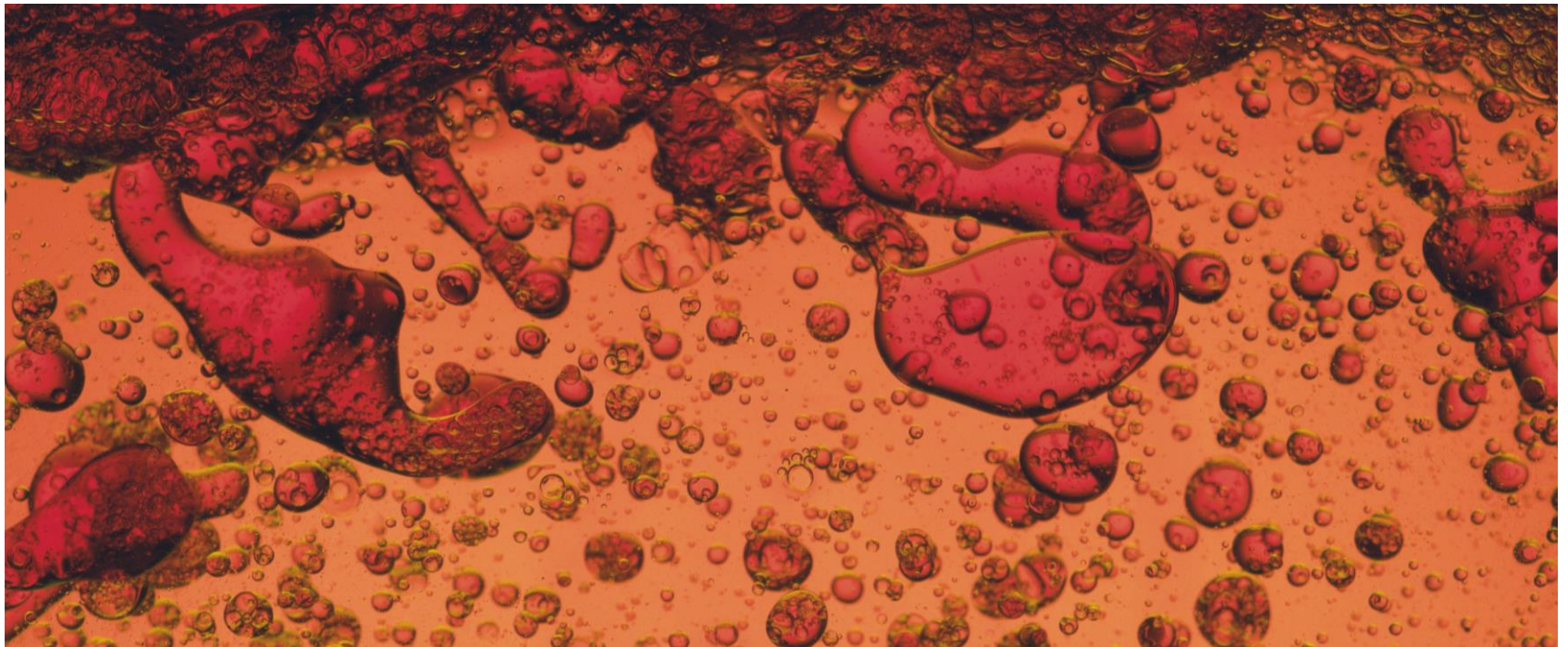


Overspill protection :
FTL51-KCG2BB4G5A
L = 1254 mm



Interface Measurement

- Next Level “Levelflex”



Interface basics

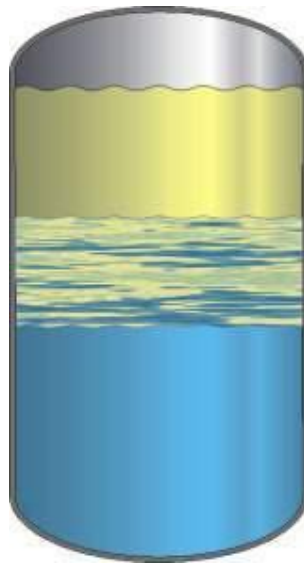
What is an interface layer?

Clear interface layer



High precision

Emulsion



Several interface layers



Foam

Oil

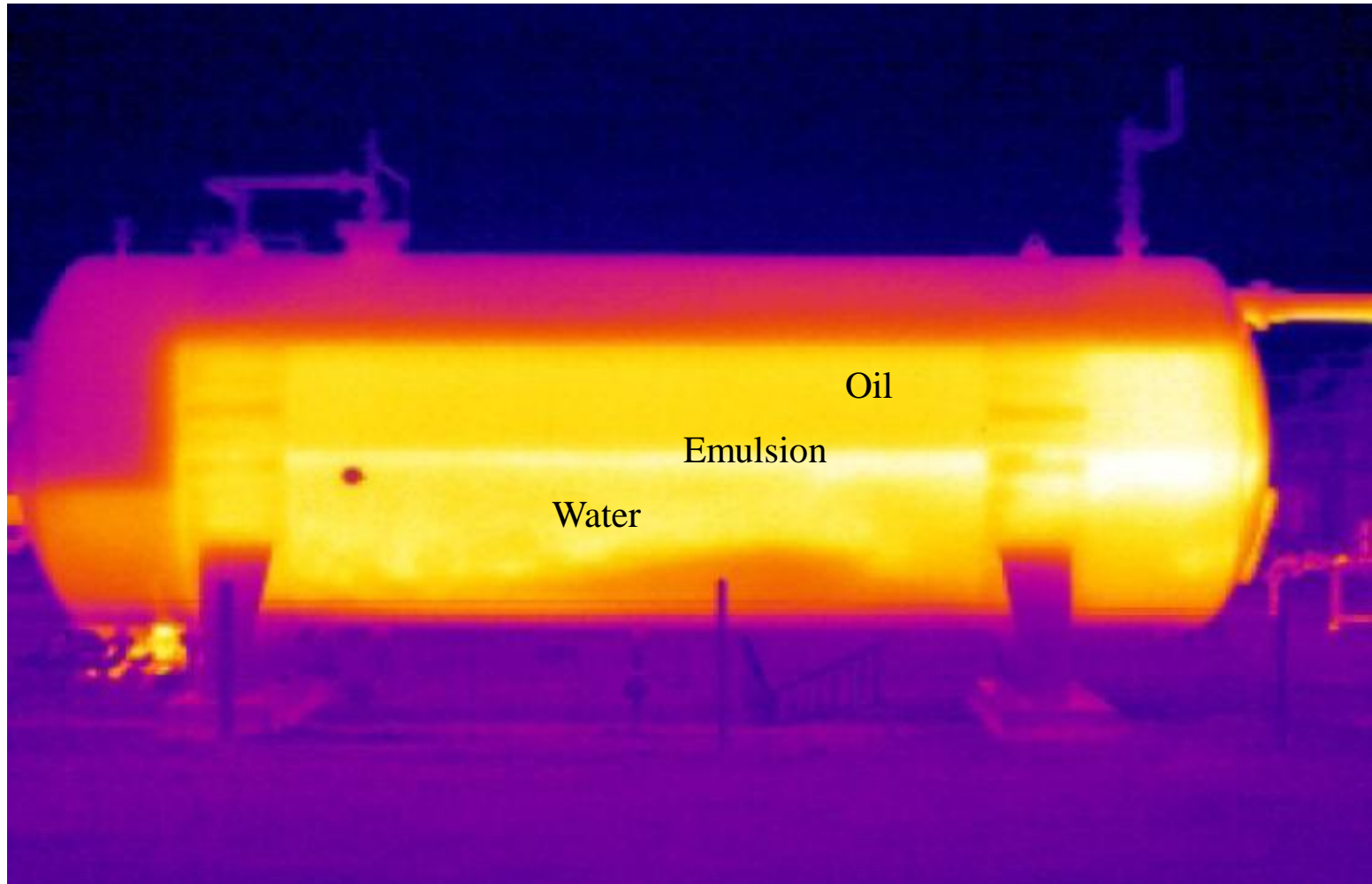
Emulsion

Water

Sand

E.g. separator

Infrared thermal image of emulsion layer in separator













Available technologies


Most used

- • Float systems
- Conductive probes
- • Displacer
- • Magnetostrictive (+floats)
- Ultrasonic
- • Capacitance
- Optical systems
- • Radiometric
- Differential Pressure Transmitter
- Side glasses
- Vibrating forks
- • TDR
- Bubbler
- **TDR + Capacitance => FMP55 Multiparameter**



E+H offering for interface applications

	Guided radar  Levelflex FMP51/52/54	Multiparameter  Levelflex FMP55	Capacitance  Liquicap FMI51/52	Radiometry  Gammapiot FMG60
<ul style="list-style-type: none"> Clear interface liquid / liquid 	Total level + interface layer	Total level + interface layer	Interface layer	
<ul style="list-style-type: none"> Interface with emulsion layer liquid / liquid 	Not possible	Total level + interface layer	Interface layer	Interface layer + emulsion thickness 
<ul style="list-style-type: none"> Interface with emulsion layer liquid / liquid Interface liquid / solid Multiple layer interface liquid / solid 	Not possible	Not possible	Not possible	Interface-density-profile 

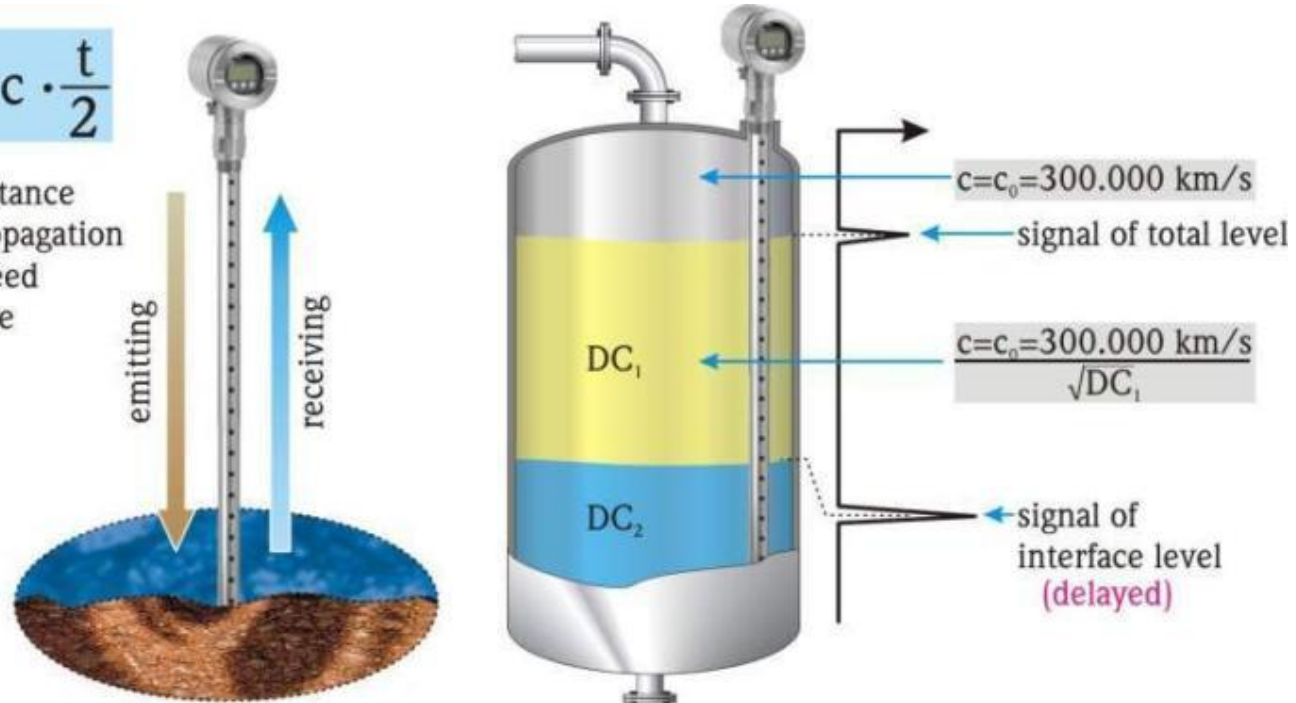
 Our proposal

Traditional TDR Interface measurement

TDR: Functional Principle

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

d = distance
c = propagation
speed
t = time



- High-frequency pulses are injected to a probe and reflected by the product surface
- The distance to the product surface can be calculated using the time-of-flight information
- Whenever DC₁ is small, one part of the pulse will penetrate through the upper medium
- A second reflection will take place at the interface between the lower medium with a higher DC₂.
- The distance to the interface can be calculated under consideration of the reduced time-of-flight within the upper medium.

TDR: Summary

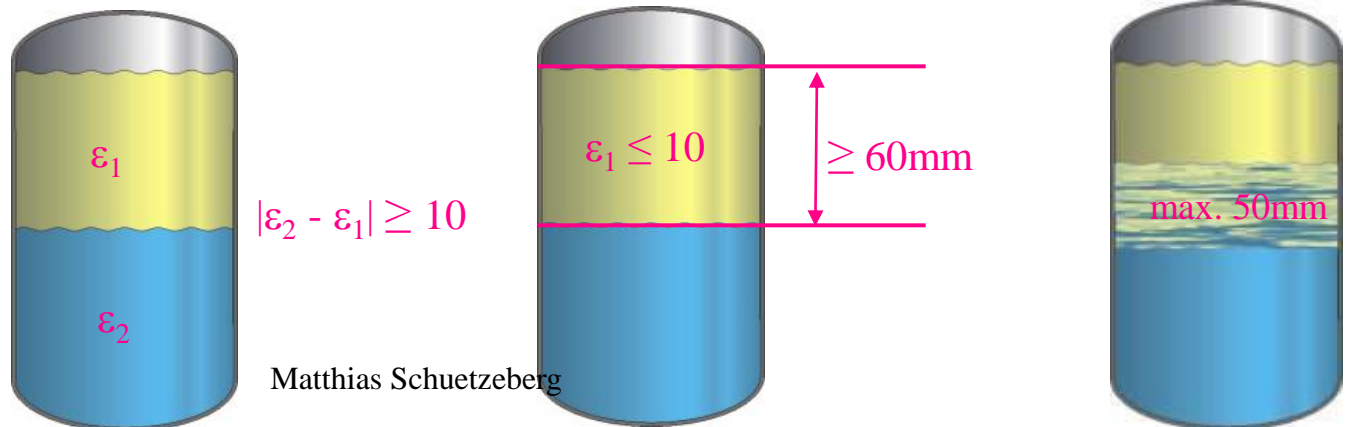


Advantages

- Simultaneous measurement of level + interface
- Independent of temperature and density changes
- Measurement in high P and T applications
- No moving parts → low maintenance
- Sedimentation on the probe will have marginal influence on the measurement

Limits / preconditions

- Emulsion layer max. 50mm
- Delta DC min. 10
- DC of upper fluid max. 10
- Upper thickness > 60mm
- DC upper medium must remain constant



Multiparameter interface - Levelflex FMP55

Dual Technology Interface Measurement ...

With Capacitance alone

- + measurement with emulsions possible
- no overall level measurement



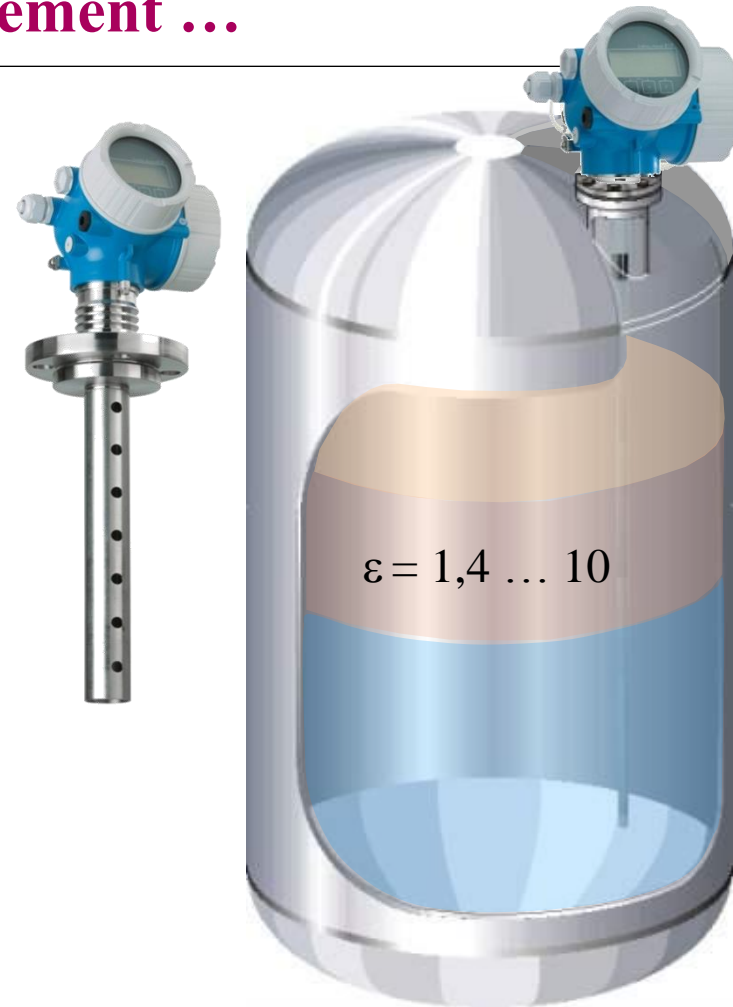
With Guided Radar alone

- + two parameters : level + interface
- Dielectric must be programmed
- no measurement with thick emulsions



FMP 55 : Capacitance + GWR

- + two parameters : level + interface
- + Dielectric independent / self calibration
- + measurement with emulsions possible
- + diagnosis of build up



New Technology!



FMP55 – Benefits

The Multiparameter for interface measurement



- Up to 3 measurements (level, interface, upper phase thickness) with one device
- Determination of interface and/or level if one echo is lost (e.g. due to emulsion, damping, bypass fully flooded)
- Determination of the interface if multiple layers may occur
- Continuous plausibility check of TDR echoes
- Determination of the medium property if only one medium is filled

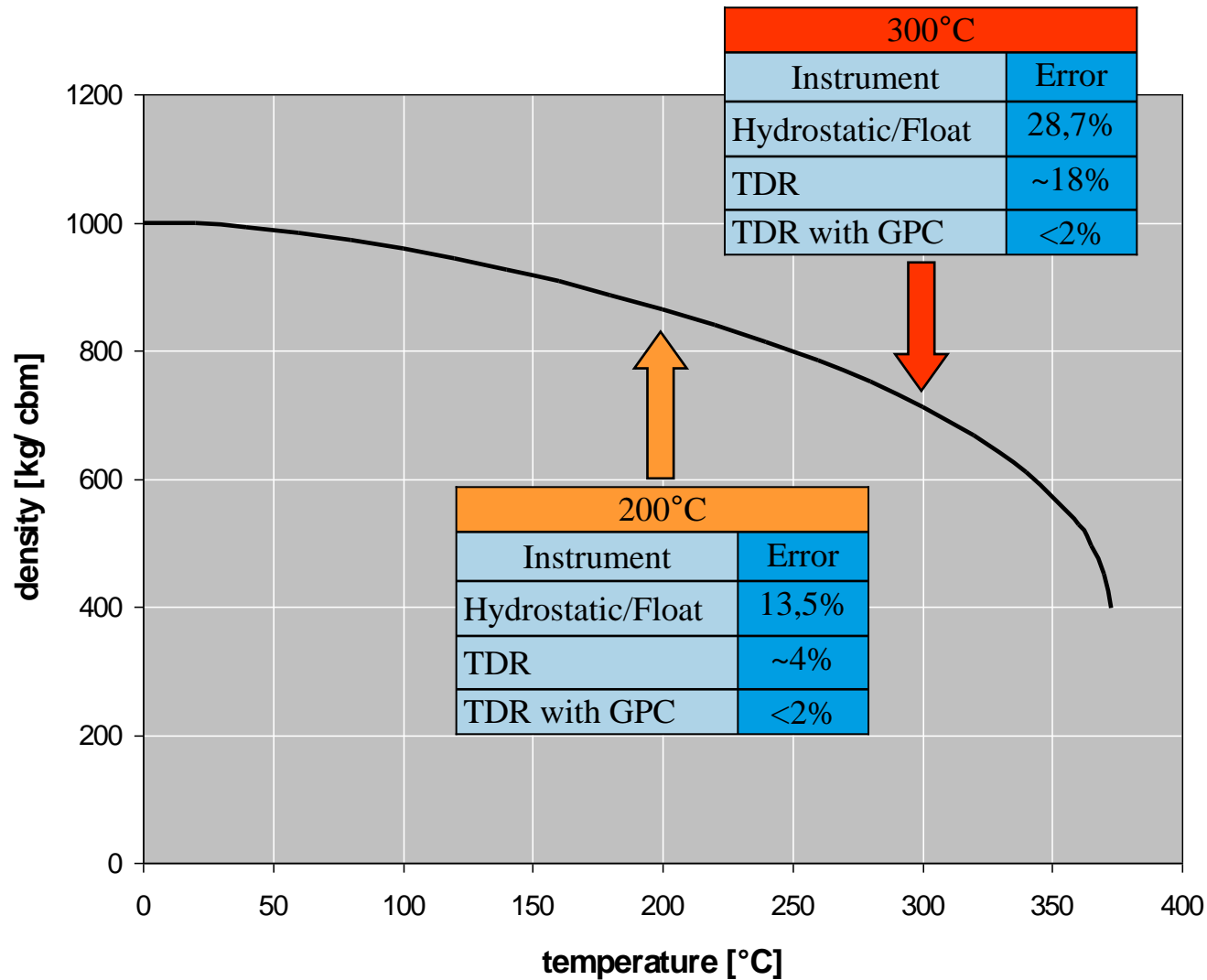
Applications

Process: Stream drum
T=314°C (597°F), P=106bar (1537lbs)



Result:	Measured error <u>without</u> Gas Phase Compensation:	27,4%
	Measured error <u>with</u> Gas Phase Compensation:	4%

Density of Water / Resulting Errors



*Gas Phase Compensation

Theory: Velocity (V) of Electromagnetic Waves

$$V = C' = \frac{C_0}{\sqrt{\epsilon_R} \sqrt{\mu_R}}$$

μ_r : Transmissibility of media for magnetic fields

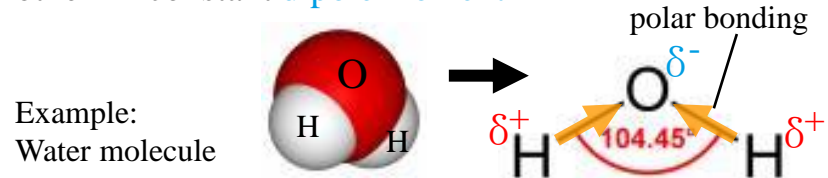
- Nearly constant for most gases
- Nearly independent of temp. / press.

ϵ_r : Transmissibility of media for electrical fields

- Can vary significantly in the **polar gases** in combination with **high temp. / press.**

Polar media:

One atom has a greater **electro-negativity** than the other → constant **dipole moment**

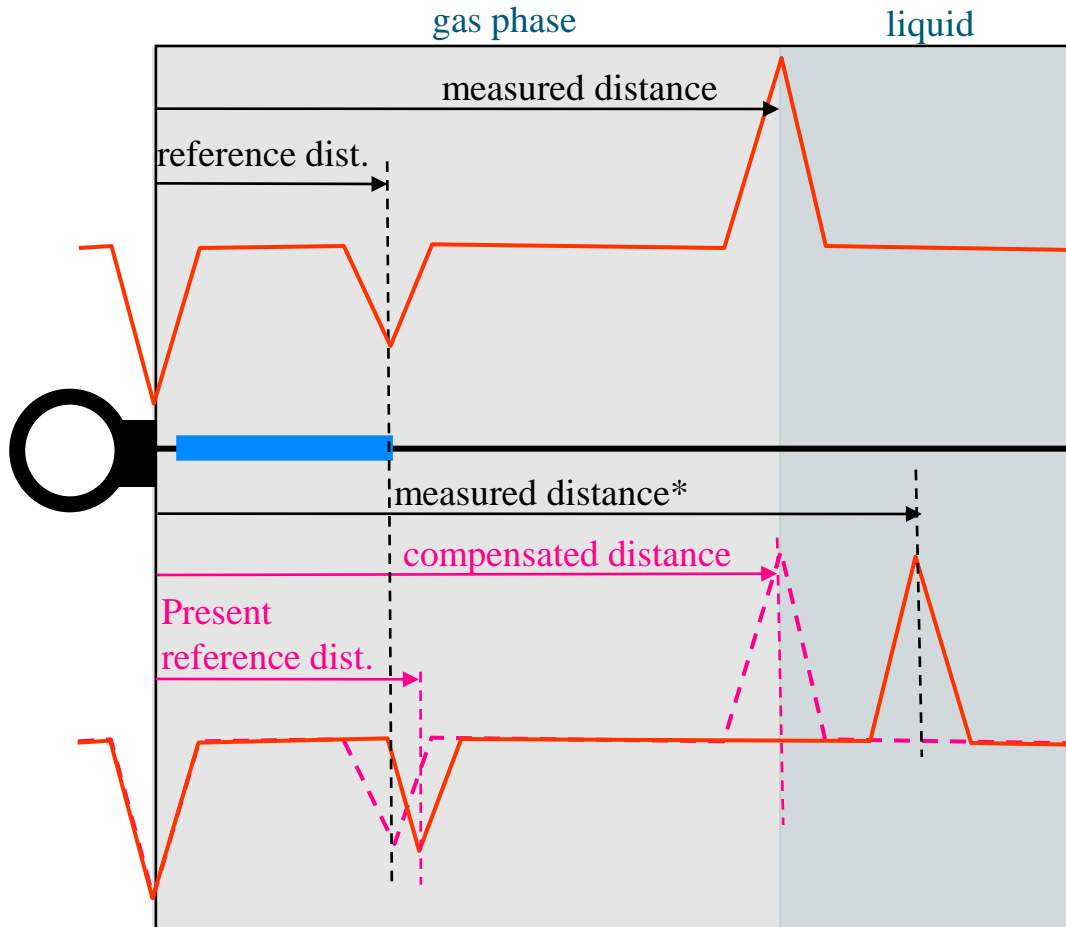
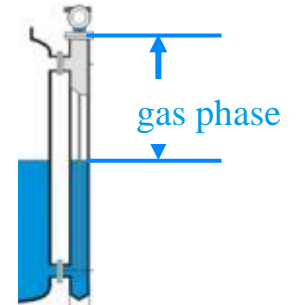


	Formula	Description	Example
Polar	AB	Linear Molecules	CO
	HA _x	Molecule with a single H	HCl
	A _x OH	Molecules with OH at the end	C ₂ H ₅ OH
	O _x A _y	Molecules with O at the end	H ₂ O
	N _x A _y	Molecules with N at one end	NH ₃
Non polar	A _x	All elements	O ₂
	C _x A _y	Most carbon compounds	CO ₂

Example steam: Resulting errors in the gas phase

gas phase	temperature		pressure							
	°C	°F	1 bar 14,5 psi	2 bar 29 psi	5 bar 72,5 psi	10 bar 145 psi	20 bar 290 psi	50 bar 725 psi	100 bar 1450 psi	200 bar 2900 psi
steam (water vapor)	100	212	0,26%							
	120	248	0,23%	0,50%						
	152	306	0,20%	0,42%	1,14%					
	180	356	0,17%	0,37%	0,99%	2,10%				
	212	414	0,15%	0,32%	0,86%	1,79%	3,9%			
	264	507	0,12%	0,26%	0,69%	1,44%	3,0%	9,2%		
	311	592	0,09%	0,22%	0,58%	1,21%	2,5%	7,1%	19,3%	
	366	691	0,07%	0,18%	0,49%	1,01%	2,1%	5,7%	13,2%	76%

Function of Automatic Compensation



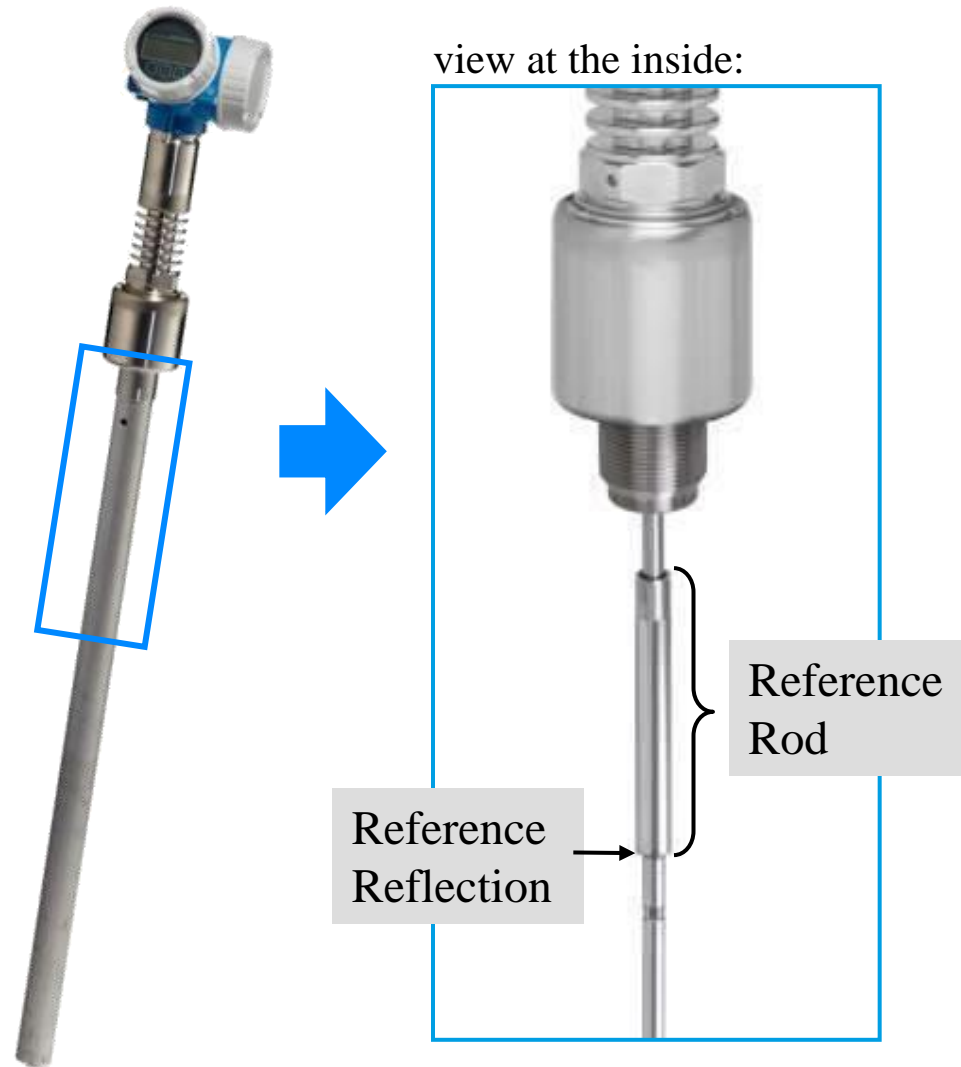
unpressurized state
(calibration of reference distance)

Pressurized* state
(with occurring run-time shift)

$$\text{compensated distance} = \frac{\text{reference dist.}}{\text{present ref. dist.}} \times \text{measured distance}^*$$

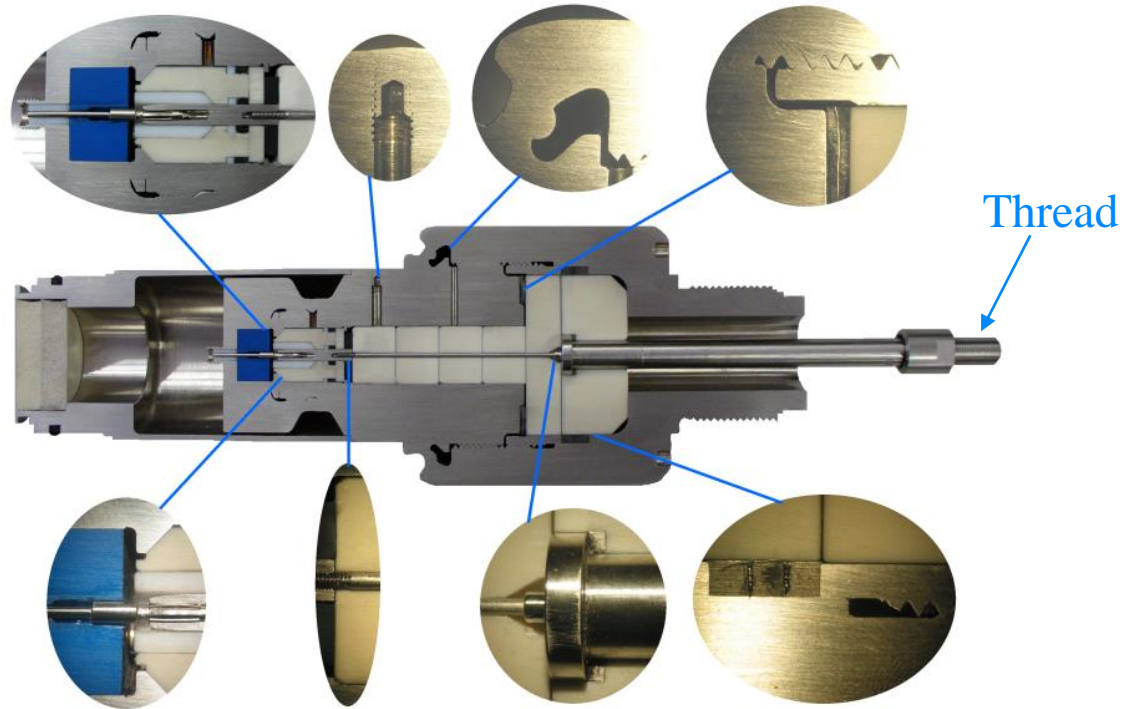


Construction



FMP54 – Spare parts of the probe


Antenna FMP54 (HT and HP)









Automatic gas phase compensation



Precise level measurement
in gas/steam phase in liquids

Endress+Hauser 

Industries Levelflex FMP5x

Chemicals		FMP50*	FMP51	FMP52		FMP54	FMP55	FMP56	FMP57
O & G		FMP50*	FMP51	FMP52		FMP54	FMP55		
Power			FMP51	FMP52		FMP54		FMP56	FMP57
Primaries		FMP50*	FMP51					FMP56	FMP57
Food				FMP52	FMP53			FMP56	FMP57
Life Sciences				FMP52	FMP53				

* Utility applications

Applications in the Chemical Industry

Interface measurement in chemicals (FMP55)

- Redundant measurement with guided radar and capacitance
- 3 values (level/ interface/ thickness upper layer)
- Not effected by emulsion layers
- Maintenance free → no moving parts



Distillation columns (displacer replacer, FMP51, 52, 54)

- Not effected by density changes
- Maintenance free → no moving parts
- Fast to setup without the need of a wet calibration
- Highest safety due gas tight feed through
- Highest reliability due to multiple echo tracking and redundancy via end of probe (EOP) algorithms
- HistoRom data management for fast maintenance



High temp / high pressure applications (FMP54)

- Not effected by density changes or vacuum
- Maintenance free → no moving parts
- No need for a wet calibration
- Highest safety due gas tight feed thru
- Not effected by steam (Gas Phase Compensation)
- SIL2 according to IEC 61508



Applications in Oil & Gas

Distillation columns (FMP54)

- No moving parts
- Easy set-up and mounting in by-pass
- Measurement possible up to +450°C (842°F) /400 bar (5800 psi)
- Maintenance free
- High measurement reliability



Crude oil desalter (FMP55)

- Redundant measurement based on SensorFusion technology
- Highest safety due gas tight feed thru
- Chemical resistant materials and design
- Heavy duty 316L SS housing



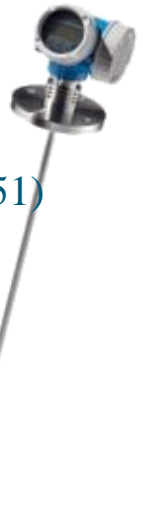
Crude dehydration (FMP55)

- Redundant measurement based on SensorFusion technology
- Highest safety due gas tight feed thru
- Chemical resistant materials and design
- Heavy duty 316L SS housing



Water processing, produced water (FMP51)

- Easy to install and to setup
- NACE compliance materials
- Very precise and accurate measurement
- Possibility for interface measurement (w/o emulsion)



Levelflex in high vacuum tower in a Mexican Refinery



- Level measurement in a bypass installation, in a high vacuum tower in the refinery with 400° C degrees and vacuum pressure
- Project for substitute other technologies in bypass installations.
- Model for other Refineries, start to be spread the good results.

Levelflex in high vacuum tower in a Mexican Refinery

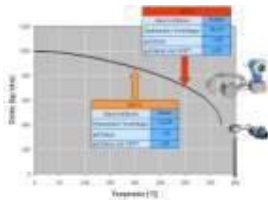


Installation of the Levelflex FMP 45 in the high vacuum tower

Applications Power & Energy

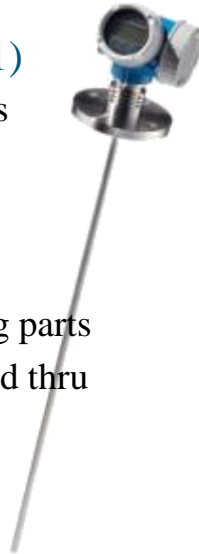
Boiler drum level (FMP54)

- Not effected by density changes or vacuum
- Maintenance free → no moving parts
- Highest safety due gas tight feed thru
- Not effected by steam (Gas Phase Compensation)
- SIL 2 according to IEC 61508



Main condenser level (FMP51)

- Not effected by density changes or vacuum
- Increased temperature range (up to +200°C / 392°F)
- Maintenance free → no moving parts
- Highest safety due gas tight feed thru
- SIL 2 according to IEC 61508



Level in lime silos (FMP57)

- Robust probe design
- Build up detection via monitoring of the EoP shift
- Reliable measurement performance based on continuous adapting algorithms (echo tracking and tracing)



Level in ammonia tanks (FMP54, FMP51)

- Highest mechanical integrity due to 2nd line of defense
- SIL 2 according to IEC 61508



Applications Primaries



Dust collectors (FMP56 / 57)

- Independent from moisture content or dust properties
- Maintenance free → no moving parts
- Independent from filling noise or dust even during pneumatic filling
- Independent from surface properties
- HistoRom data management for fast maintenance
- Price flexibility for applications with low demanding pull down forces



Additives (like Gypsum,...) (FMP56 / 57)

- Maintenance free → no moving parts
- Independent from filling noise or strong dust even during conveyer belt filling
- Independent from surface properties also under mirror reflecting conditions
- Simple set up with on site display (without software) HistoRom function offers a fast solution to copy the setup to the next similar bin via the display



Secondary fuels / disposal of solvents (FMP50 / 51)

- Not effected by density changes or changing liquid mixtures
- Fast to setup without the need of a wet calibration
- Highest reliability due to multiple echo tracking and redundancy via end of probe (EOP)
- Independent from surface conditions (like foam, ...)

...in a nut shell

Take home messages...



CAA
inside

- **Uniform commissioning** in accordance to HMI standard
- Developed in accordance to **IEC 61508 (SIL2)**
- Compliance with all important NAMUR guidelines: e.g. for **diagnosis NE107**
- **Quick setup menu** for fast and easy setup
- **HistoROM** simplifies commissioning and enables diagnostic functions
- **Two chamber housing as standard** for comfortable and secure installation
- **Up to 17 languages**, for easy local commissioning
- Highest reliability due to innovative **Multi-Echo Tracking** of various tank echoes

Take home messages...



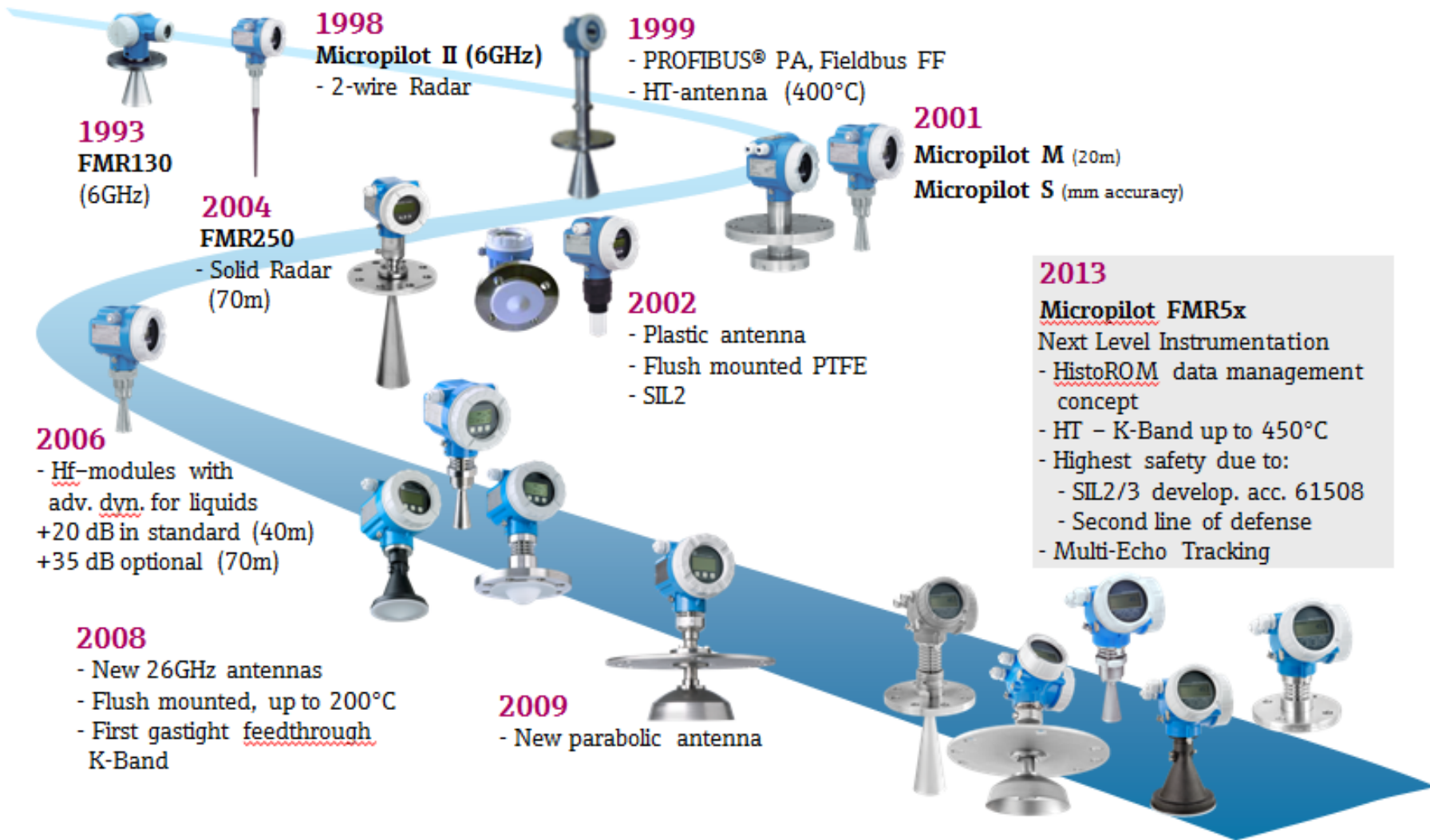
- The Multi-parameter sensor FMP55
- The new basic device FMP50
- Gas tight feed thru as option for FMP51 and FMP52
- FMP54 HT version with enlarged temperature range up to 450°C
- New IO modules (switch output or two 4..20mA outputs)
- Heavy duty stainless steel housing
- Plastic housing as basic version



NEXT LEVEL



Micropilot – more than 300.000 applications world wide



Custody transfer Non Contact Radar Level measurement

- High Precision Micropilot S
 - +/- 0.5 mm
- Custody transfer approved (e.g. PTB, NMi)
- Complete system including Multi-Spot-Temperature and Inventory Management Software
- FMR 532 - Stilling wells antenna
- FMR 540 – Horn antenna (small beam angle)



Servo Level Gauge

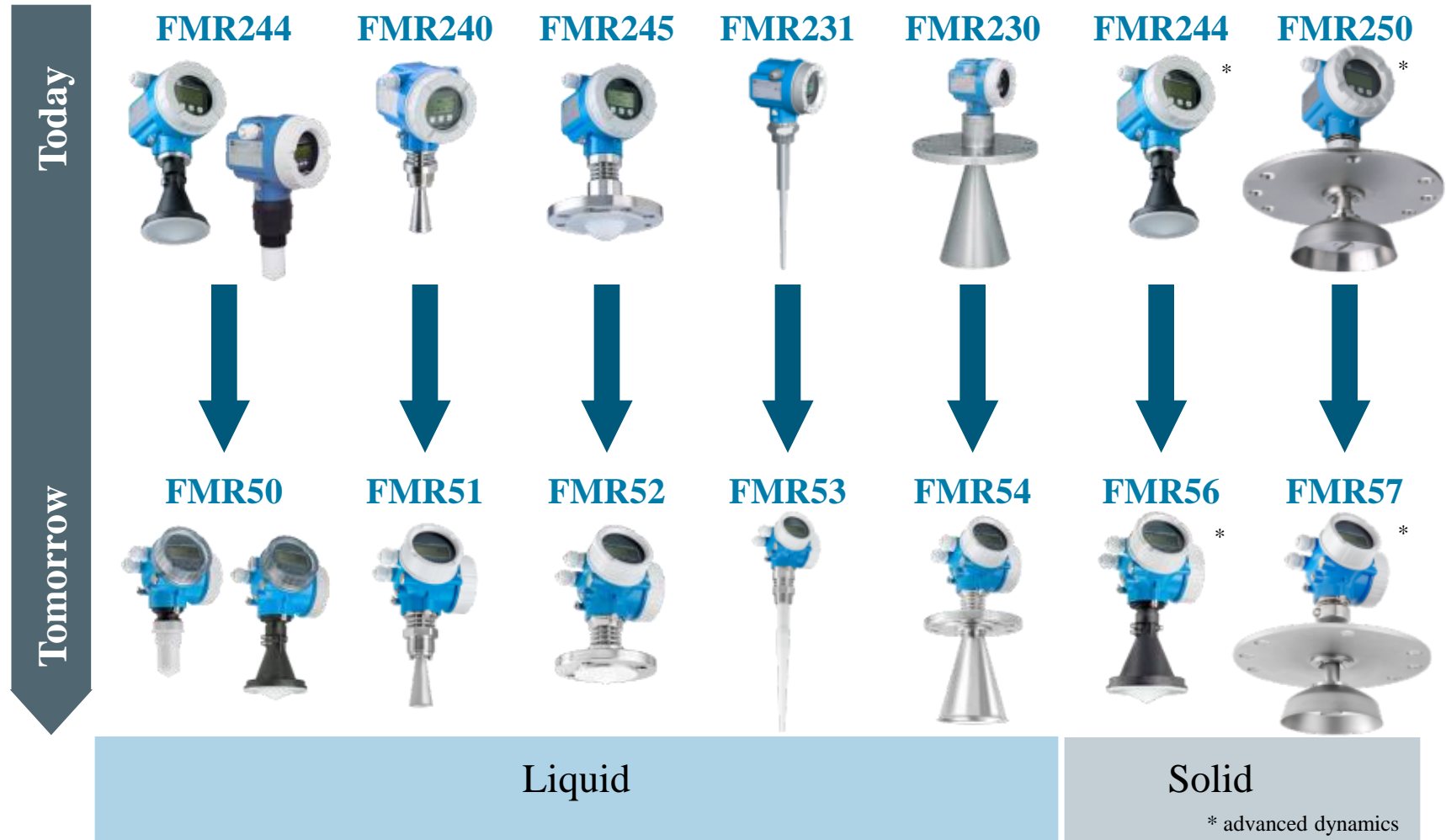
- Intelligent servo tank gauge - Proservo NMS5x-Series
 - **3 Measurements** with 1 Instrument:
 - Level
 - Interface (water) measurement (3 layers)
 - Density measurement (up to 16 points)
 - **High accuracy - ± 0.7 mm,**
 - Independent of product's vapor pressure, DK value, foam and surface conditions
 - Servo is the only approved technology (e.g. PTB) for custody transfer in LPG
 - **No. 1 choice for LPG**
 - **No blocking distance**



Next Level Instrumentation



The Next Level Instrumentation – overview



Content Micropilot (2012)

Housing

NEW



Plastic



Alu

NEW



316L

Display

NEW

mechanical buttons or optical buttons for operation from outside (Feb. 2013)



plastic



NEW



316L in prep.

Remote Display FHX50

Approval



ATEX



+ 1Q.

Electronics

+

HistoROM

NEW



4-20mA

-

2-wire



NEW



4-20mA

4-20mA



NEW



4-20mA

PFS

NEW



4-20mA

DC



4-wire



4-20mA

AC

basic liquid



NEW

+ 100mm horn

FMR50

liquid



NEW

up to 250°C or 450°C

FMR51

hygienic/corrosion resistant



FMR52

insulated



FMR53

HT/HP



NEW

+ planar

FMR54

basic solid



NEW

+ 100mm horn

FMR56

solid










NEW

up to 400°C

FMR57

Industries Micropilot FMR5x

TOP Focus	O & G Chemicals		FMR50*	FMR51	FMR52	FMR53	FMR54	FMR56	FMR57
			FMR50*	FMR51	FMR52	FMR53	FMR54		
	Power		FMR50*	FMR51	FMR52			FMR56	FMR57
	Primaries		FMR50*					FMR56	FMR57
	Food			FMR51	FMR52				
	Life Sciences				FMR52				
	W&WW		FMR50						

* Utility applications

Micropilot FMR50



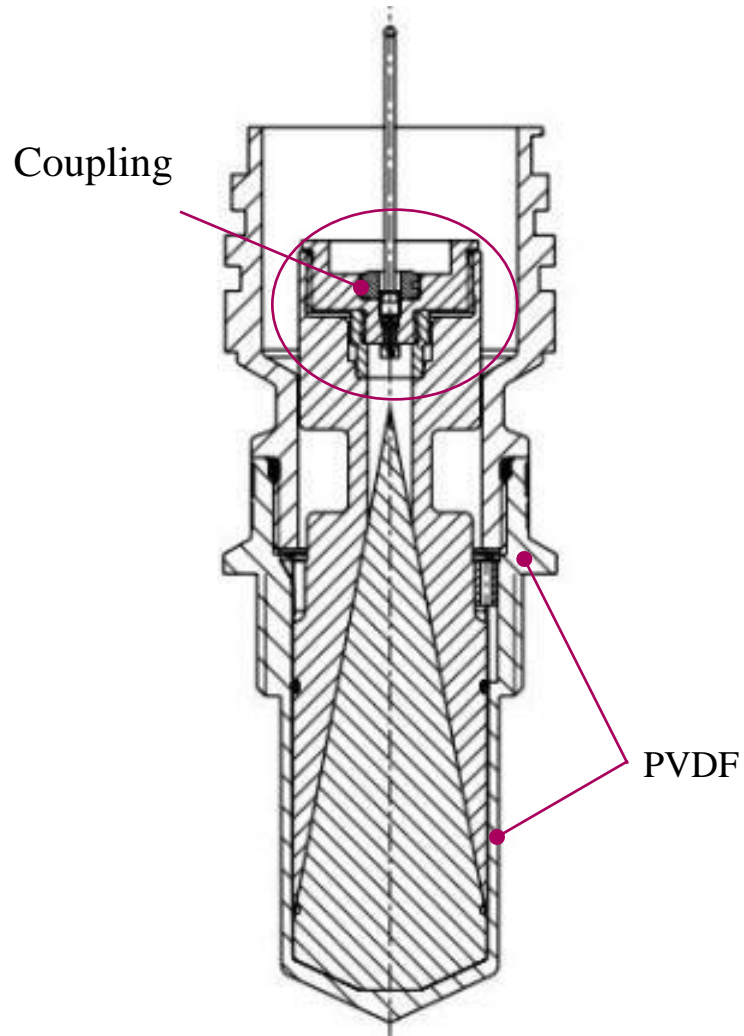
FMR50

FMR50 – For common applications

- Optimum price-performance ratio
- Temperature -40...+130°C/-40...+266°F
- Pressure -1...+3bar/-14.5...+43.5psi
- Process connection: 1½" thread, assembly bracket or slip-on flange
- Max. measuring range: up to 40m/131ft
- Accuracy up to ±2mm/0.078inch
- K-Band 26GHz



FMR50 – DN40



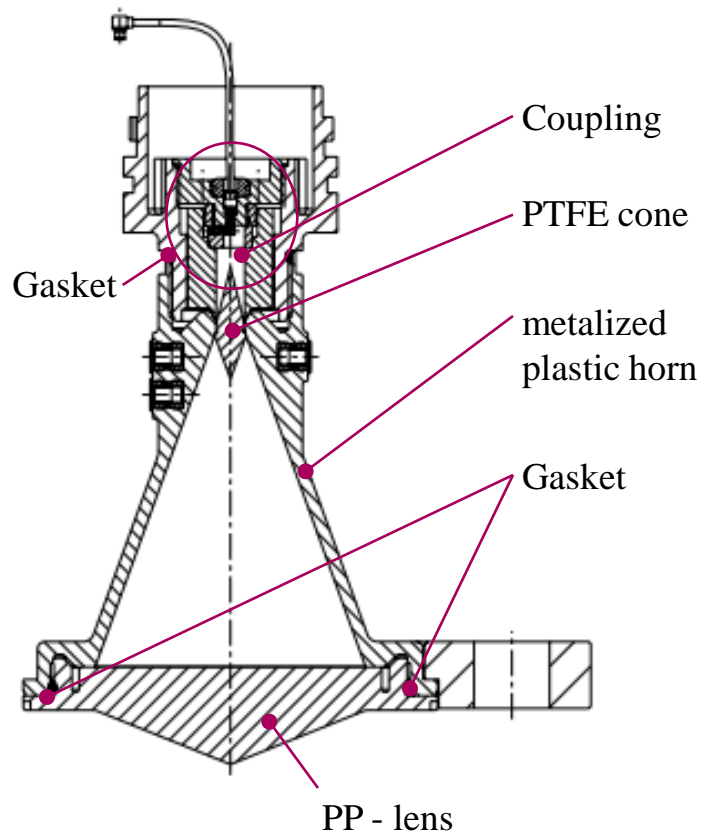
Antenna:

- DN40 antenna fully encapsulated

Materials:

- PVDF

FMR50 – DN80/DN100



Antenna:

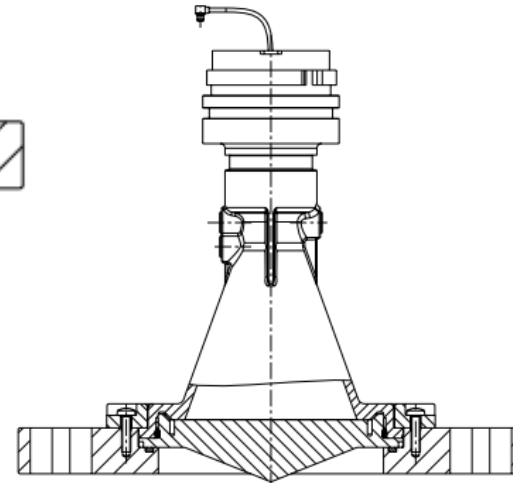
- DN80 & DN100
- Flange versions available

Sealing:

- Silicon gasket at lens and process adapter

Materials:

- PP



Micropilot FMR51/52



FMR51 – The Allrounder

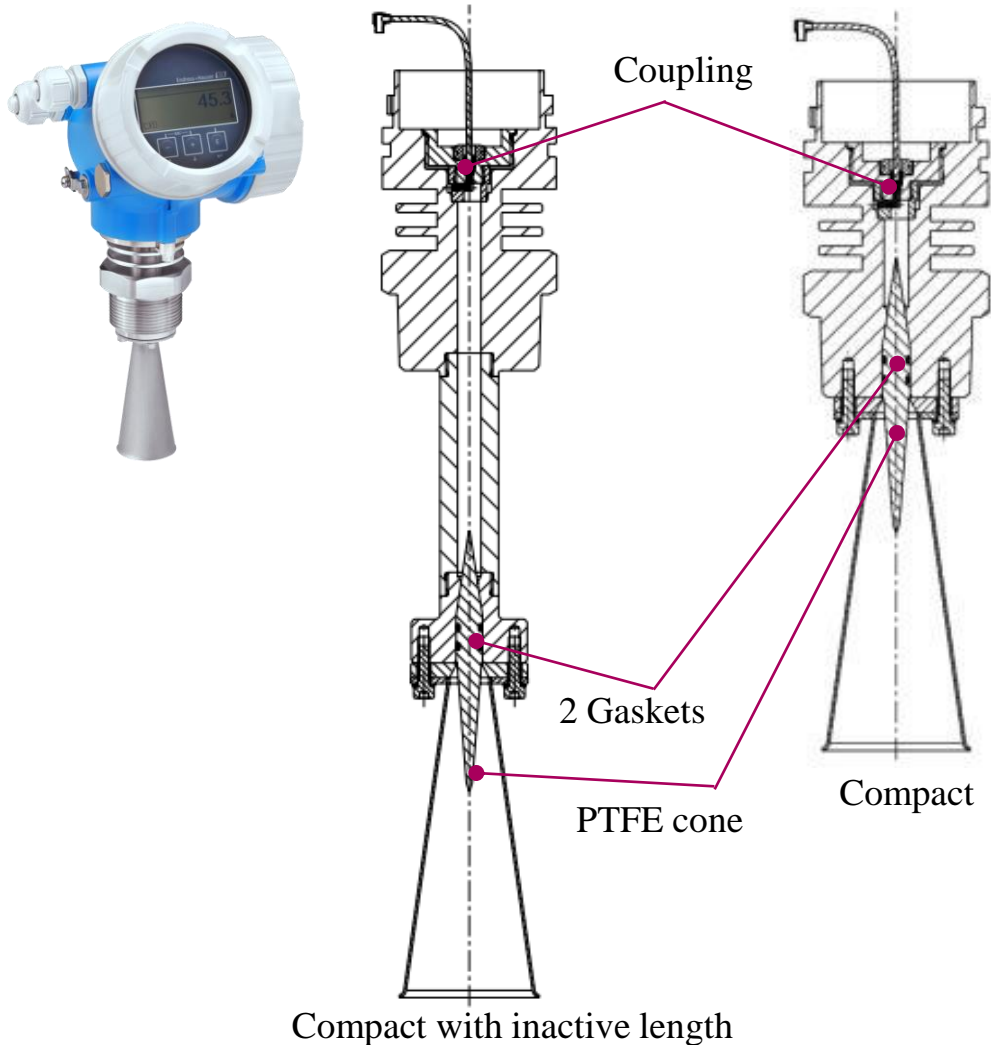
- Process connection 1½" thread, tri-clamp or flange
- Highest safety due to second line of defense with gastight feedthrough
- Temperature -196...+450°C/-321...+842°F
- Pressure -1...+160bar/-14.5...+2,320psi
- Max. measuring range: up to 70m/230ft
- Accuracy up to ±2mm/0.078inch
- K-Band 26GHz

FMR52 – For aggressive media

- Complete PTFE filled horn antenna, flush mounted
- Temperature -40...+200°C/-40...+392°F
- Pressure -1...+16bar/-14.5...+232psi
- Max. measuring range: up to 60m/197ft
- Gastight feedthrough (option)
- Accuracy up to ±2mm/0.078inch
- K-Band 26GHz



FMR51 Compact



Antenna:

- Horn antenna
DN40, DN50,
DN80, DN100
- Gastight feedthrough (option)
- 100mm inactive length
(option)

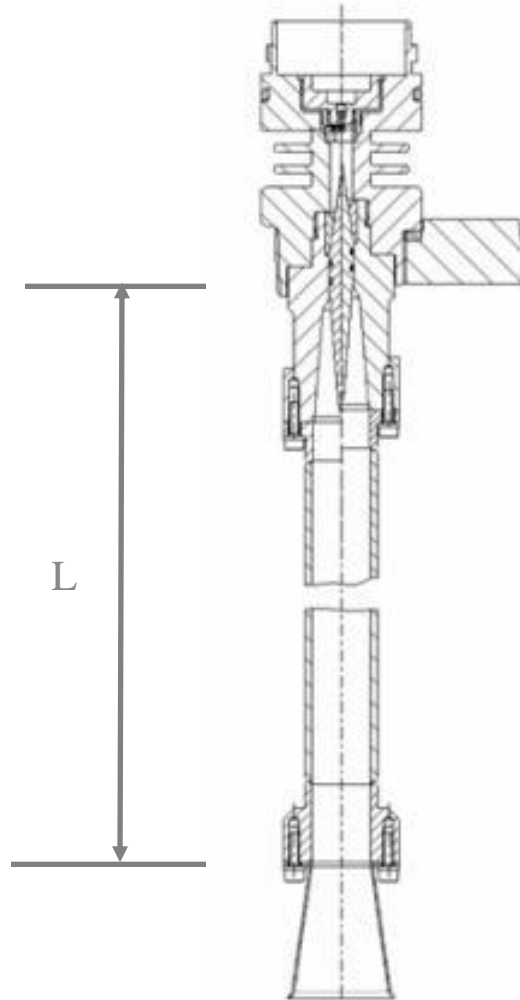
Sealing:

- Viton GLT,
-40...150°C/-40...302°F
- Kalrez,
-20...150°C/-4...302°F

Materials:

- PTFE, 316L, Alloy

FMR51 with extension based on waveguide (optional)



Antenna:

- Horn antenna
DN40, DN50,
DN80, DN100
- With extension based on
waveguide
(accessory mounted)
- Gastight feedthrough (option)
- Variable antenna extension
 $L = 100\text{mm} < L < 500\text{mm}$
(accessory mounted)

Sealing:

- Viton GLT,
 $-40 \dots 150^\circ\text{C} / -40 \dots 302^\circ\text{F}$
- Kalrez,
 $-20 \dots 150^\circ\text{C} / -4 \dots 302^\circ\text{F}$

Materials:

- PTFE, 316L, Alloy

Micropilot FMR51



FMR51 – The Allrounder

- Highest safety due to second line of defense with gastight feedthrough
- Temperature $-196...+450^{\circ}\text{C}/-321...+842^{\circ}\text{F}$
- Pressure $-1...+160\text{bar}/-14.5...+2,320\text{psi}$
- Max. measuring range: up to 70m/230ft
- Accuracy up to $\pm 2\text{mm}/0.078\text{inch}$
- K-Band 26GHz



Micropilot FMR52



FMR52

FMR52 – For aggressive media

- Complete PTFE filled horn antenna, flush mounted
- Temperature -40...+200°C/-40...+392°F
- Pressure -1...+16bar/-14.5...+232psi
- Max. measuring range: up to 60m/197ft
- Gastight feedthrough (option)
- Accuracy up to **±2mm/0.078inch**
- K-Band 26GHz

FMR52 – For highest hygienic requirements

- Flush mounted and gap-free design according to **ASME BPE (CoC)**
- Parts in contact with the medium are **FDA-listed** according to **USP Class VI**
- Hygiene process connections
- Proven biological compatibility



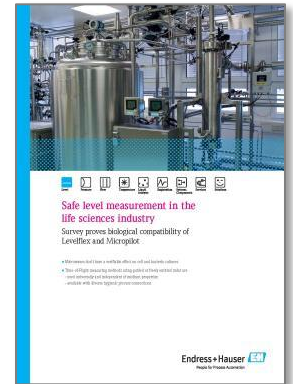
Micropilot FMR52



FMR52

FMR52 – For highest hygienic requirements

- Flush mounted and gap-free design according to **ASME BPE (CoC)**
- Parts in contact with the medium are **FDA-listed** according to **USP Class VI**
- Hygiene process connections
- Proven biological compatibility for Micropilot or Levelflex
- Process temperature
-40...+200°C/-40...+392°F
- Process pressure
-1...+16bar/-14.5...+232psi
- Max. measuring range: up to 60m/197ft
- Accuracy up to **±2mm/0.078inch**
- K-Band 26GHz

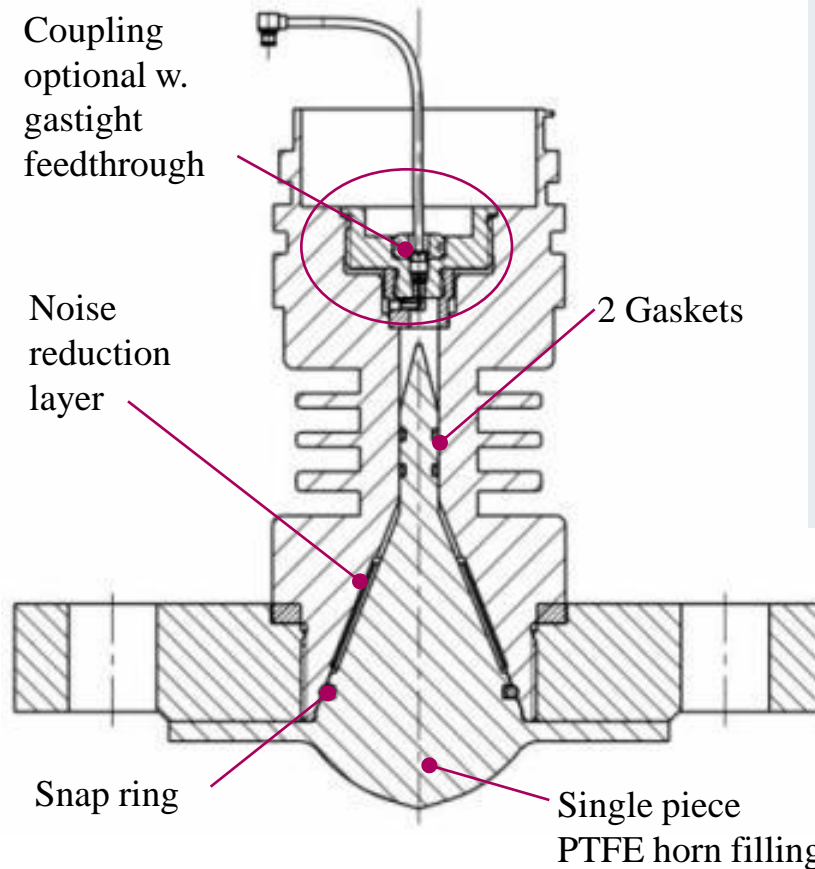


FMR52 (PTFE filled antenna, flush-mounted)



Coupling
optional w.
gastight
feedthrough

Noise
reduction
layer



Antenna:

- Horn
DN50, DN80,
flush mount
- Gastight feedthrough
(as option)

Sealing:

- PTFE,
-40...200°C/-40...302°F

Materials:

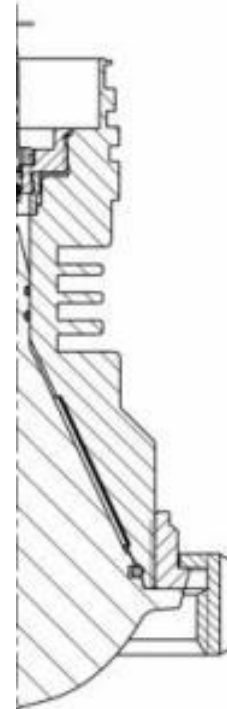
- PTFE, 316L

FMR52 (PTFE filled antenna, flush-mounted)

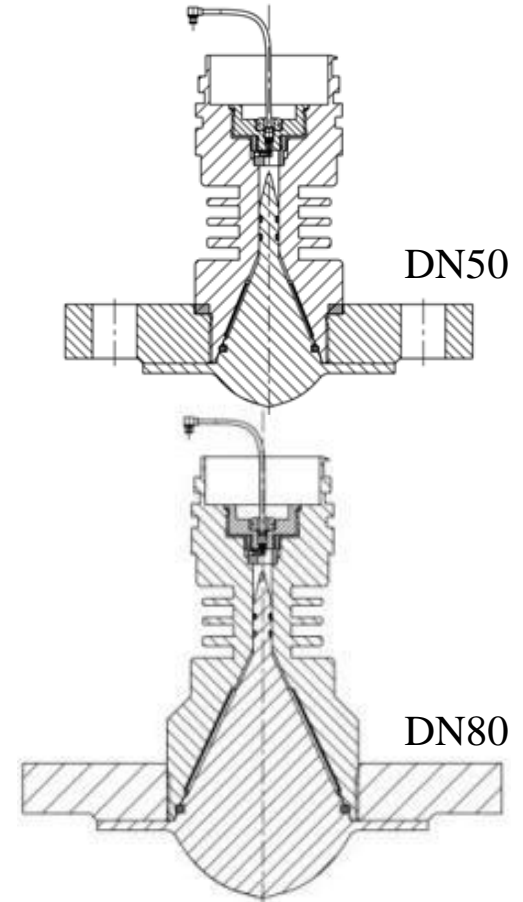
FMR52 Process Connections



Tri- Clamp ISO 2852
2" / 3" / 4"



DIN 11851
DN50 / DN80



Flanges

Internal: Micropilot FMR53/54 C-Band (6GHz module)



FMR53



FMR54

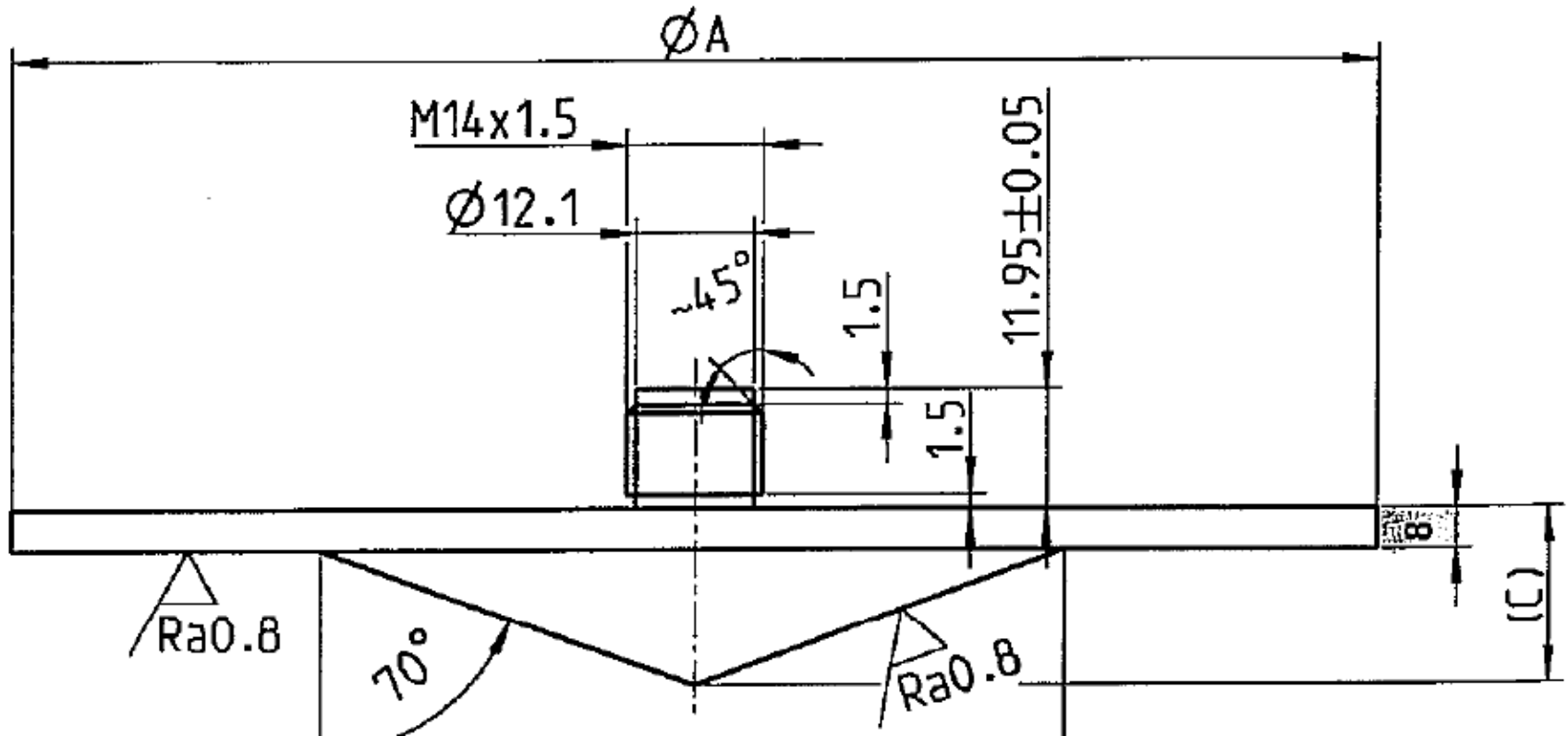
Internal Information:

With the FMR53/54 the new C-Band HF-Module is **fully developed** and produced in PC Maulburg like all K-Band HF-Modules

PTFE Window



PTFE Window



Micropilot FMR53



FMR53

FMR53 – For common applications in liquids

- Optimum price-performance ratio
- PTFE coating of the rod antenna including flange plating
- Process temperature
-40...+150°C/-40...+302°F
- Process pressure
-1...+40bar/-14.5...+580psi
- Process connection: 1½" thread or flange
- Max. measuring range: 20m/66ft
- Accuracy up to **±6mm/0.23inch**
- C-Band 6GHz



Micropilot FMR54



FMR54

FMR54 – For special applications in liquids

- Available with horn or **stilling well (planar) antenna**
- Process temperature
-196...+400°C/-321...+752°F
- Process pressure
-1...+160bar/-14.5...+2,320psi
- Process connection: flange
- Max. measuring range: 20m/66ft
- Accuracy up to **±6mm/0.23inch**
- C-Band 6GHz



Micropilot FMR57

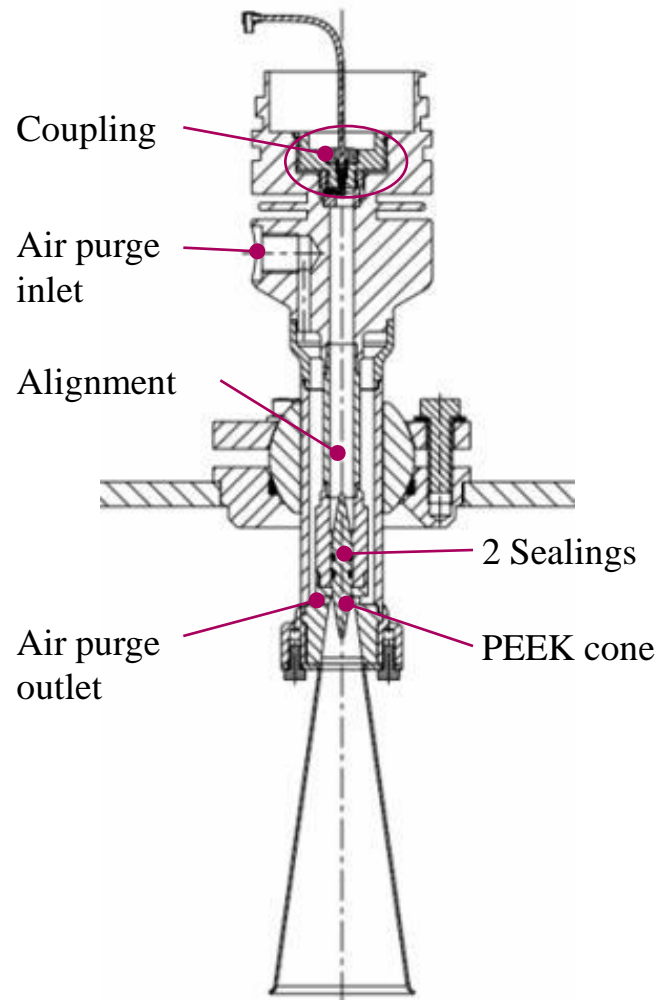


FMR57 – The standard in bulk solids

- Optimum adaption to the surface of the bulk solid with alignment device
- Air purge connection
- Process connection: 1½" or flange
- Temperature -40...+400°C/-40...+752°F
- Pressure -1...+16bar/-14.5...+232psi
- Max. measuring range: 70m/230ft
- K-Band 26GHz



FMR57 Horn



Antenna:

- Horn antenna
80mm /3", 100mm/4"
- Alignment (option)
- Air purge (standard)

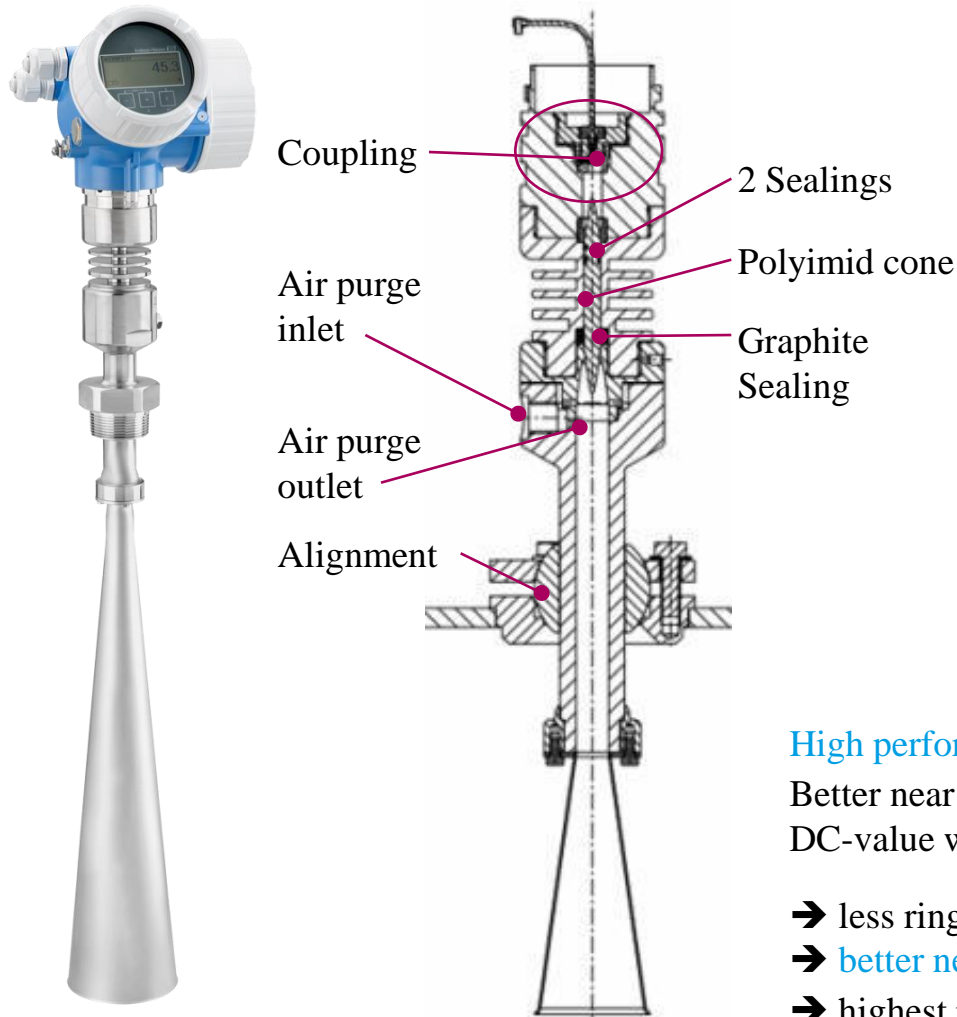
Sealing:

- Viton GLT,
-40...200°C/-40...392°F

Materials:

- PEEK, 316L

FMR57 Horn HT (400°C)



Antenna:

- Horn antenna
80mm /3", 100mm/4"
- Alignment (option)
- Air purge (standard)

Sealing:

- Graphite, -40...400°C/-40...752°F
- Double sealed with 2 additional Viton gaskets

Materials:

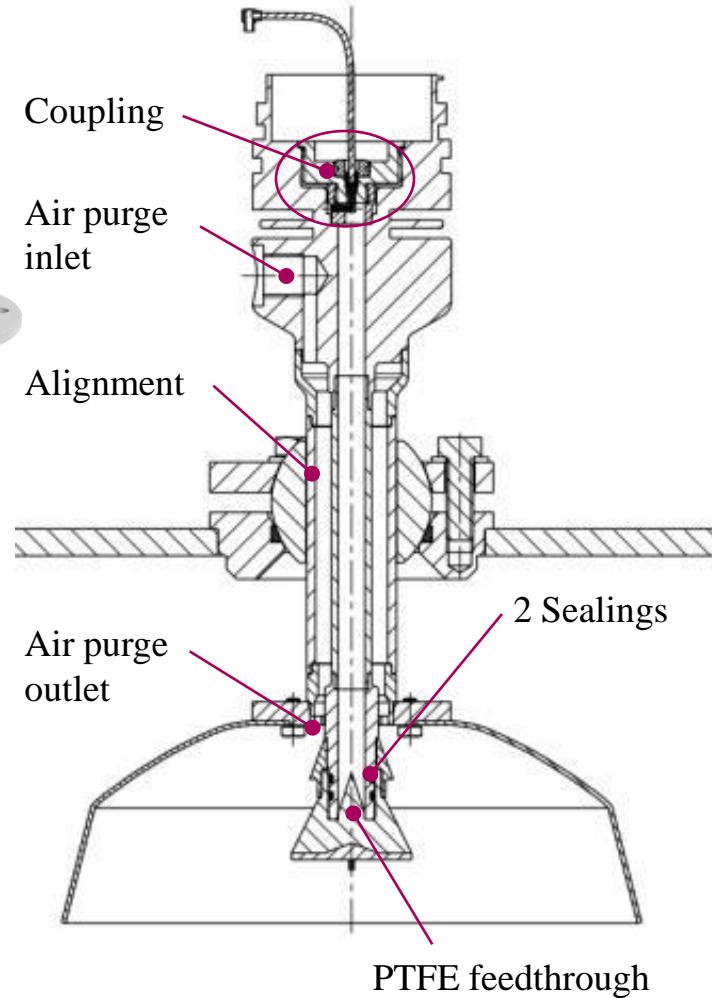
- 316L, Polyimid (Upimol)

High performance/high temperature plastic - Polyimid

Better near distance performance than ceramic, because lower DC-value with better incoupling characteristic

- ➔ less ringing in the near field
- ➔ better near field performance
- ➔ highest reliability for the customer

FMR57 Parabolic (Solid) (26GHz)



Antenna:

- Parabolic antenna
200mm/8", 250mm/10"
- Alignment (option)
- Antenna extension
250mm/10", 450mm/18"
- Air purge (standard)

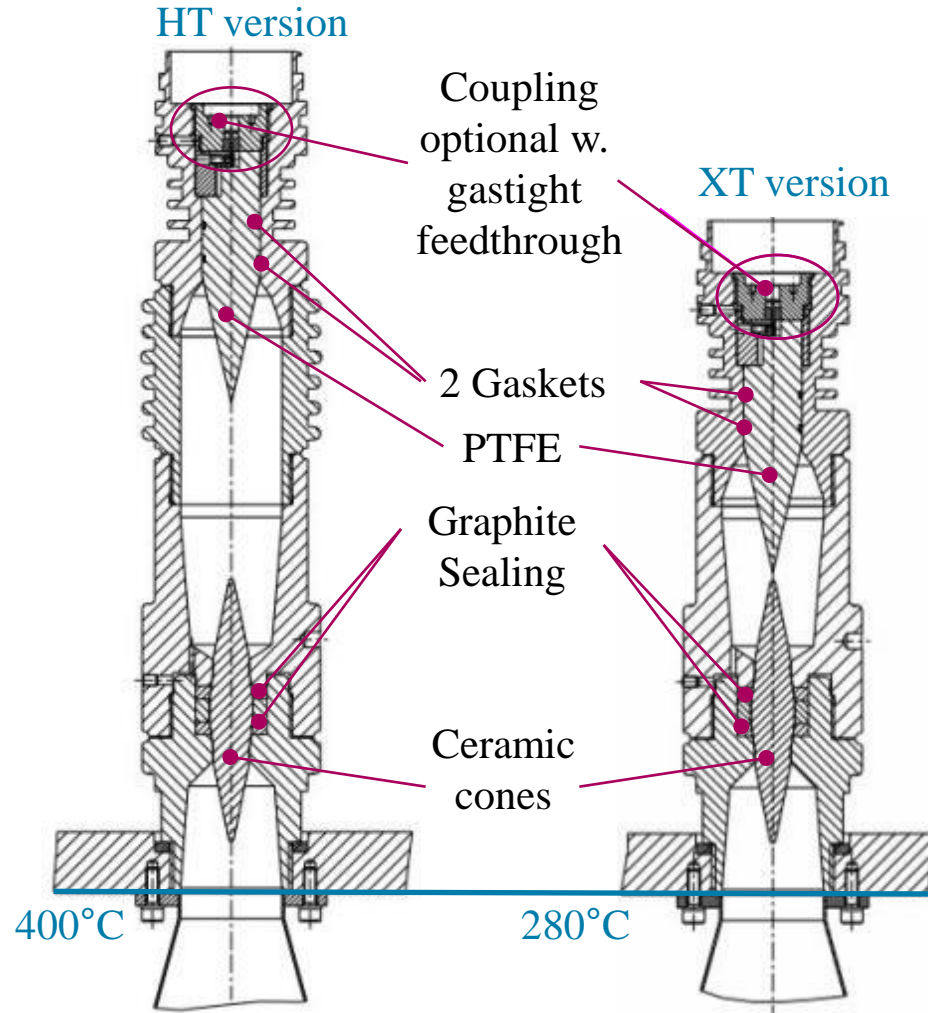
Sealing:

- Viton GLT,
-40...200°C/-40...392°F

Materials:

- 316L, PTFE

FMR54 XT/HT (Horn antenna)



Antenna:

- Without horn antenna for pipe installation
- With Horn antenna
DN80 / 3", DN100 / 4"
DN150 / 6", DN200 / 8"
DN250 / 10"
- Gastight feedthrough (option)

Sealing:

- (XT), Graphite,
-196...280°C/-321...536°F
- (HT), Graphite,
-196...400°C/-321...752°F

Materials:

- 316L, Al₂O₃

Micropilot FMR51/54 for high temperature applications



FMR51

FMR54



WHG

FMR51 – For sophisticated measuring tasks

- Highest safety due second line of defense with gastight feedthrough
- Up to SIL3 (homogeneous redundancy)
- Process connection: 1½" thread, tri-clamp or flange
- Temperature -196...+450°C/-321...+842°F
- Pressure -1...+160bar/-14.5...+2,320psi
- Max. measuring range: 70m/66ft
- Accuracy up to $\pm 2\text{mm}/0.078\text{inch}$
- K-Band 26GHz

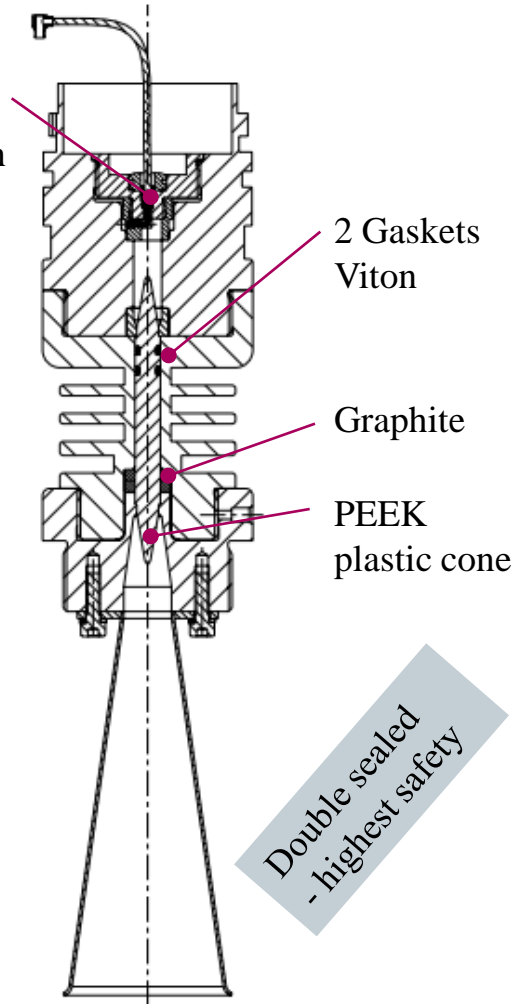
FMR54 – For special applications in liquids

- Available with horn or planar antenna
- Temperature -196...+400°C/-321...+752°F
- Pressure -1...+160bar/-14.5...+2,320psi
- Process connection: flange
- Max. measuring range: 20m/66ft
- Accuracy up to $\pm 6\text{mm}/0.23\text{inch}$
- C-Band 6GHz

FMR51 XT (250°C)



Coupling
optional w.
gastight
feedthrough



Antenna:

- Horn antenna
DN40, DN50,
DN80, DN100
- Gastight feedthrough
(as option)

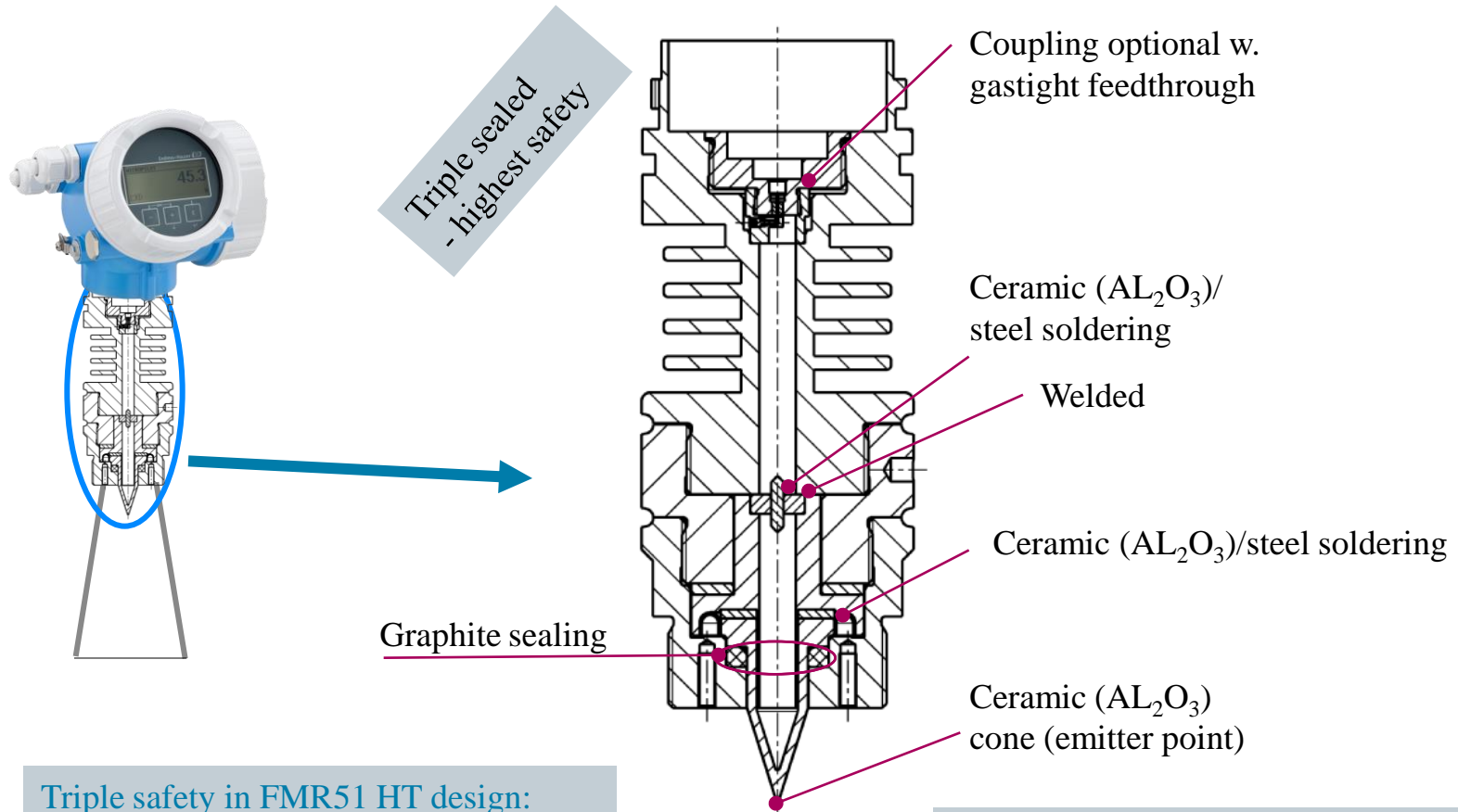
Sealing:

- Graphite,
-40...250°C/-40...482°F
- Double sealed with two
additional Viton gaskets

Materials:

- 316L, PEEK, Alloy C

FMR51 HT (450°C)



Triple sealed
- highest safety

Triple safety in FMR51 HT design:
Two times ceramic which hold the pressure/temperature + gastight feedthrough

Big emitter point surface to the process:
Leads to best condensation behavior in class → Highest reliability

Micropilot FMR56/57

FMR56



FMR57



FMR56 – For common solid applications

- Optimum price-performance ratio
- Process connection: Assembly bracket or slip-on flange
- Temperature -40...+80°C/-40...+176°F
- Pressure -1...+3bar/-14.5...+43.5psi
- Max. measuring range: 30m/98ft
- K-Band 26GHz

FMR57 – The standard in bulk solids

- Optimum adaption to the surface of the bulk solid with alignment device
- Air purge connection
- Process connection: 1½" or flange
- Temperature -40...+400°C/-40...+752°F
- Pressure -1...+16bar/-14.5...+232psi
- Max. measuring range: 70m/230ft
- K-Band 26GHz



Micropilot FMR56



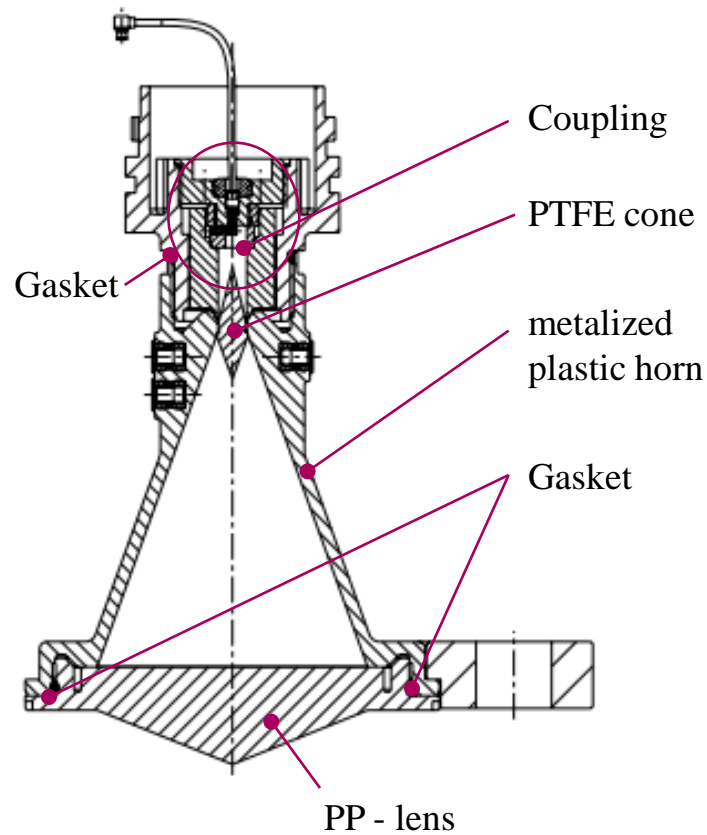
FMR56

FMR56 – For common solid applications

- Optimum price-performance ratio
- Process connection: Assembly bracket or slip-on flange
- Temperature -40...+80°C/-40...+176°F
- Pressure -1...+3bar/-14.5...+43.5psi
- Max. measuring range: 30m/98ft
- K-Band 26GHz



FMR56 – DN80/DN100



Antenna:

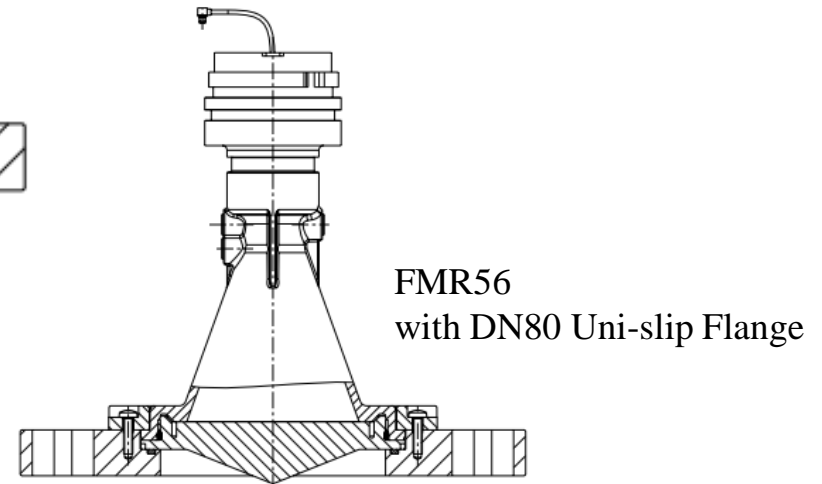
- DN80 & DN100
- Flange versions available

Sealing:

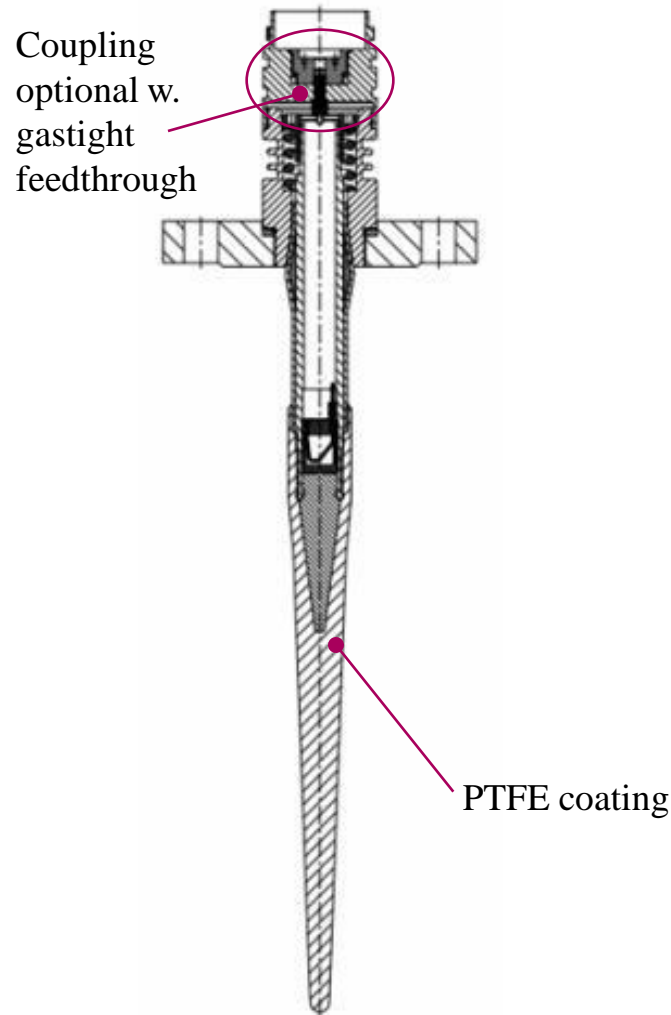
- Silicon gasket at lens and process adapter

Materials:

- PP



FMR53 (PTFE rod antenna)



Antenna:

- Completely plated PTFE Rod antenna
- Gastight feedthrough (as option)
- 2 versions for different nozzle heights

Sealing:

- PTFE
-40...150°C/-40...302°F

Materials:

- PTFE, 316L

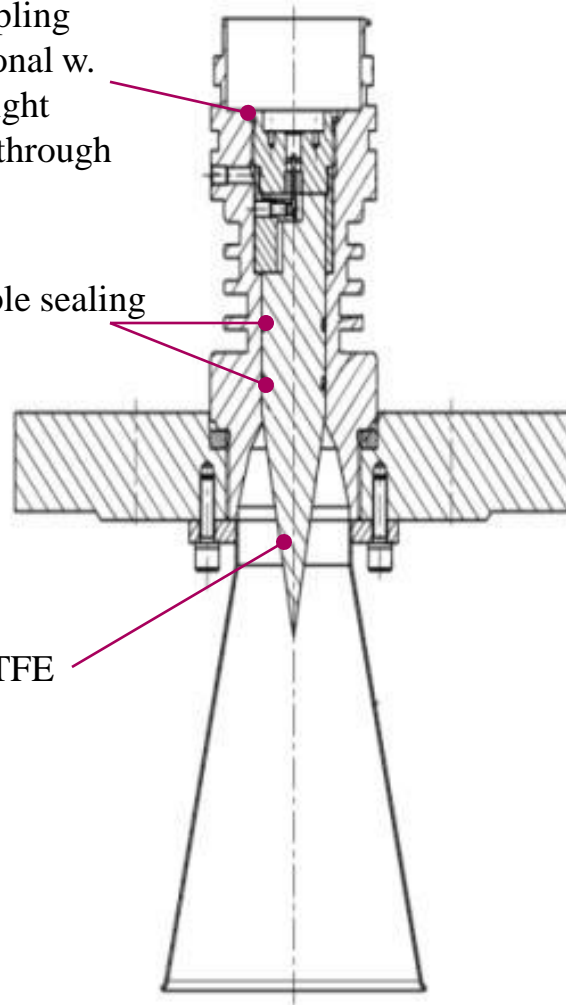
FMR54 (Horn antenna)



Coupling
optional w.
gastight
feedthrough

Double sealing

PTFE



Antenna:

- Without horn antenna for pipe installation
- With Horn antenna
DN80 / 3", DN100 / 4"
DN150 / 6", DN200 / 8"
DN250 / 10"
- Gastight feedthrough (as option)
- Antenna extension
100mm/4" , 200mm/8" , 300mm/12"
, 400mm/16"

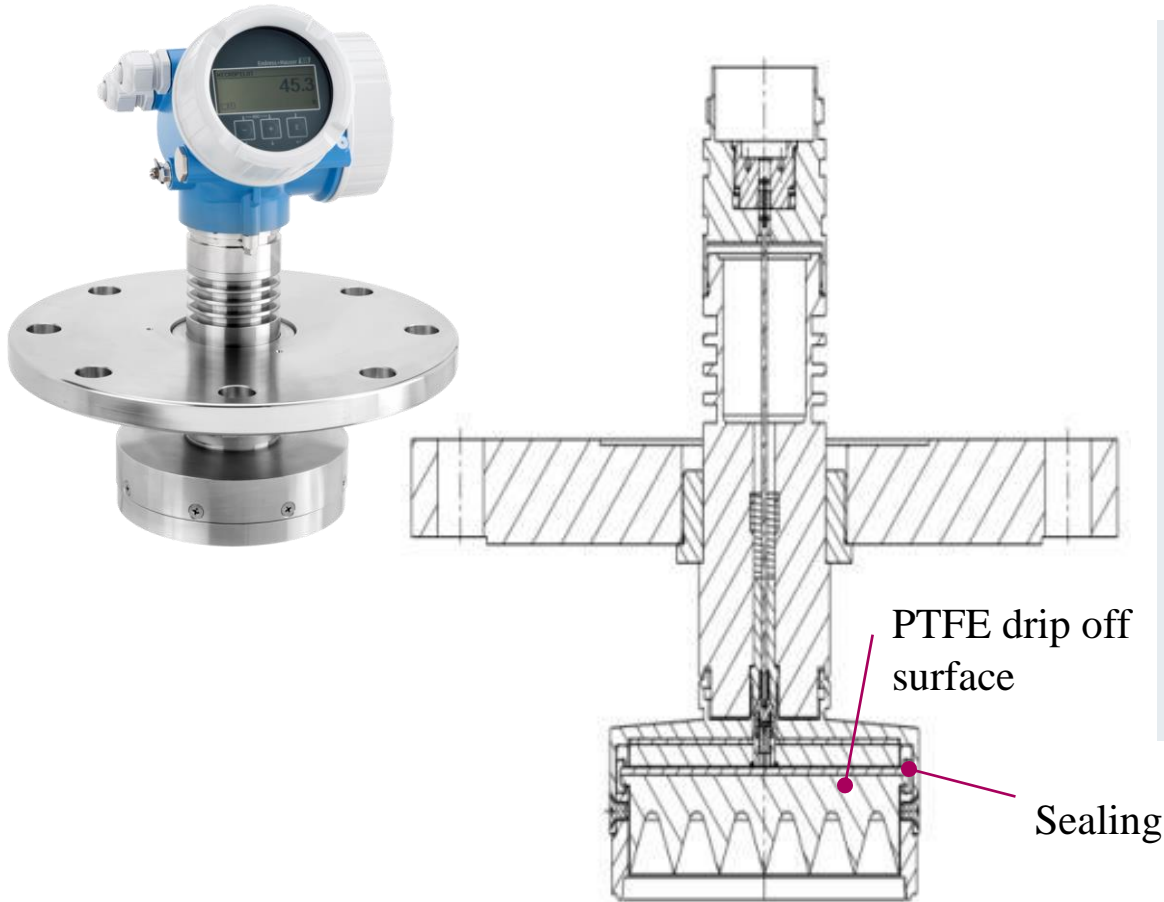
Sealing:

- Viton, -40...200°C/-40...392°F*
 - EPDM, -40...150°C/-40...302°F
 - Kalrez, -20...200°C/-4...392°F*
- *150°C for conductive media

Materials:

- 316L, PTFE

FMR54 Planar (stilling well antenna)



Antenna:

- Planar antenna
150mm/6", (wo. horn)
200mm/8", (with horn)
250mm/10", (with horn)
300mm/12", (with horn)

Sealing:

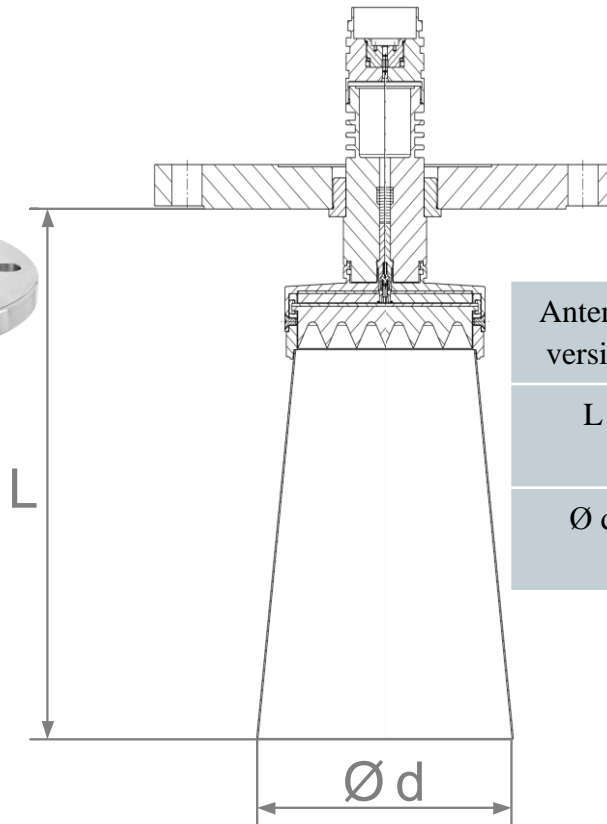
- Viton,
-20...150°C/-4...302°F

Materials:

- PTFE
- A2, 316L or 304

FMR54 Planar antenna Ø 150mm / 6"

FMR54 Planar antenna with widening horn



Antenna version	DN150 / 6"	DN200 / 8"	DN250 / 10"	DN300 / 12"
L	111mm / (4.37")	355mm / (14.00")	508mm / (20.00")	535mm / (21.10")
Ø d	No horn	192mm / (7.56")	242mm / (9.53")	292mm / (11.5")

FMR54 Planar antenna with $\text{Ø} > 150\text{mm}$ is equipped with antenna widening horn to adapt the impedance to a larger stilling well diameter!

Technology/FAB

Chapter 2.7.2

Antenna details – for Solids

Applications

Process industry



- Hardware and software developed according to IEC 61508
- High temperature and high pressure versions
- Highest process safety due to second line of defense with gastight feed through
- Accuracy $\pm 2\text{mm}$
- Multi-Echo Tracking offers safest evaluation

Life sciences



- Hardware and software developed according to IEC 61508
- Accuracy $\pm 2\text{mm}$
- Multi-Echo Tracking offers safest evaluation
- Front-flush and gap-free design according to ASME BPE (CoC)
- Parts in contact with the medium are FDA-listed according to USP Class VI

Bulk solids



- Continuous non-contact level measurement in silos
- Hardware and software developed according to IEC 61508
- Multi-Echo Tracking offers safest evaluation
- Air purge connection in standard

Micropilot FMR50/51/52/53/54 for the process industry



- Hardware and software developed according to IEC 61508
- High temperature and high pressure versions
- Highest process safety due to second line of defense with gastight feedthrough
- Accuracy $\pm 2\text{mm}$
- Multi-Echo Tracking offers safest evaluation

Process tanks



Storage tanks

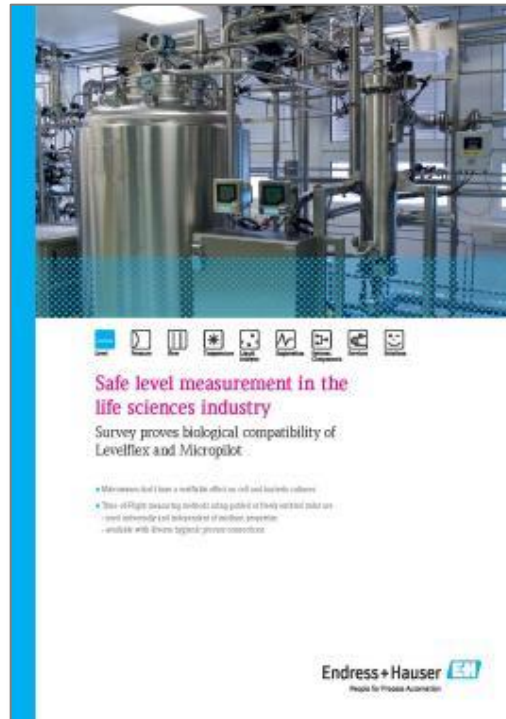
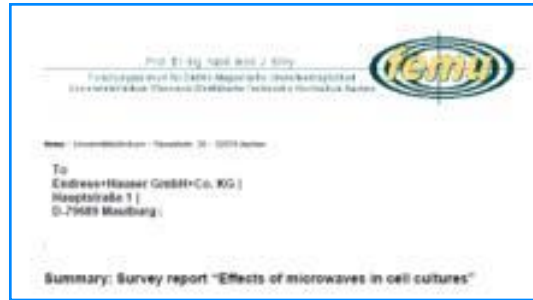
Micropilot FMR52 for food/life sciences industry



- Hardware and software developed according to IEC 61508
- Accuracy $\pm 2\text{mm}$
- Multi-Echo Tracking offers safest evaluation
- Front-flush and gap-free design according to ASME BPE (CoC)
- Parts in contact with the medium are FDA-listed according to USP Class VI



Biological compatibility of Micropilot and Levelflex



A survey report from University of Aachen has proven the biological compatibility of Micropilot and Levelflex

Micropilot FMR56/57 for bulk solids



Grain silos / Bulk storage



Cement silos










Clinker silos / Coal bunker



- Continuous non-contact level measurement in silos
- Hardware and software developed according to IEC 61508
- Multi-Echo Tracking offers safest evaluation
- Air purge connection in standard
- Temperatures up to $-40...+400^{\circ}\text{C}/-40...+752^{\circ}\text{F}$

Industries Micropilot

TOP Focus	O & G Chemicals		FMR50*	FMR51	FMR52	FMR53	FMR54	FMR56	FMR57
			FMR50*	FMR51	FMR52	FMR53	FMR54		
	Power		FMR50*	FMR51	FMR52			FMR56	FMR57
	Primaries		FMR50*					FMR56	FMR57
	Food			FMR51	FMR52				
	Life Sciences				FMR52				
	W&WW		FMR50						

* Utility applications

Applications in the Chemical Industry



Level measurement of aggressive medias

- Complete PTFE filled, flush mounted horn antennas for highest chemical resistance
- Highest safety due second line of defense with gastight feedthrough
- SIL2 according to IEC 61508, in homogenous redundancy up to SIL3
- Proof test can be done out of the control room without interruption of the process for SIL/WHG
- Fulfillment of industry standards (NAMUR NE 107, Dual seal, ...)
- Maintenance free → no moving parts
- Reduced stock keeping expenses due to platform spare part strategy
- Not effected by temperature/ pressure / density changes in the process

High temperature / High pressure applications

- Temp. up to 450°C (842°F)
- Pressure up to 160bar (2,320psi)
- Triple safety due to double ceramic coupling + gastight feedthrough
- SIL2 according to IEC 61508, in homogenous redundancy up to SIL3
- Fast setup due to no need of wet calibrations
- Fast electronic change due to HistoROM data management
- Maintenance free → no moving parts
- Seamless and independent system integration (HART/PA/FF)



Applications in the Oil & Gas Industry

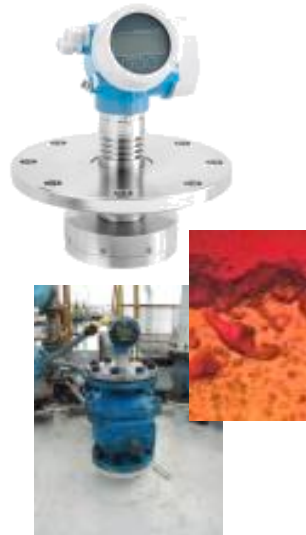


Level measurement of in storage/process tanks

- Highest safety due second line of defense with gastight feedthrough
- SIL2 according to IEC 61508, in homogenous redundancy up to SIL3
- Proof test can be done out of the control room without interruption of the process
- Maintenance free → no moving parts
- Not effected by temperature/ pressure / density changes in the process
- NACE compliance materials
- Wide variety of additional inspection and test certificates
- Seamless and independent system integration (HART/PA/FF)

Measurement in stilling well applications

- Special designed stilling well antenna with concentric electrical field is less effected by weldings or slots
- Maintenance free → no moving parts
- Fast electronic change due to HistoROM data management
- Heavy duty 316L SS housing for highest environmental resistance



Water processing

- Basic devices for water processing applications
- Reduced stock keeping expenses due to platform spare part strategy
- Easy to install and to setup
- Maintenance free → not in contact with the media



Applications in the Power Industry



Bulk solids level measurement in silos

- Robust housing (stainless steel, aluminum) and sensor concepts
- Maintenance free → no moving parts
- Independent from filling noise or dust while filling
- Cleaning connection in standard (FMR57)
- HistoROM data management for fast maintenance
- Big variety of international dust ex approvals



Coal pile/bunker level measurement

- Robust housing (stainless steel, aluminum) and sensor concepts
- Maintenance free → no moving parts
- Independent from filling noise or strong dust even during conveyer belt filling
- Highest reliability due to multiple echo tracking



Level measurement in water treatment

- Menu guided commissioning in national languages
- Big variety of housings for all environment conditions (Plastic, stainless steel, aluminum)
- Multi-Echo Tracking offers safest evaluation
- Accuracy up to $\pm 2\text{mm}$ for accurate measurement
- Reduced stock keeping expenses due to platform spare part strategy
- Not effected by temperature/strong storm velocities
- Devices are IP68/NEMA6P for highest reliability



Applications in the Primaries / Metal Industry



Bulk solids level measurement in silos

- Robust housing (stainless steel, aluminum) and sensor concepts
- Maintenance free → no moving parts
- Independent from filling noise or dust while filling
- Cleaning connection in standard (FMR57)
- HistoROM data management for fast maintenance
- Big variety of international dust ex approvals



Pile/bunker level measurement

- Robust housing (stainless steel, aluminum) and sensor concepts
- Maintenance free → no moving parts
- Independent from filling noise or strong dust even during conveyer belt filling
- Highest reliability due to multiple echo tracking

High temperature level measurement

- Temperatures up to 400°C
- Fast menu guided commissioning in national languages
- Simple setup with on-site display (without software), HistoROM function offers a fast solution to copy the setup to the next similar bin via the display

Applications in the Life Sciences / F+B Industry



Level measurement in hygienic applications

- Front-flush and gap-free design according to ASME BPE (CoC), 3A, EHEDG
- Parts in contact with the medium are FDA-listed according to USP Class VI
- Proven biological compatibility of Micropilot/Levelflex with no effect on cell or bacteria cultures
- Multi-Echo Tracking offers safest evaluation
- Accuracy up to $\pm 2\text{mm}$ for accurate level measurement of valuable products
- Reduced stock keeping expenses due to platform spare part strategy
- Not effected by temperature/ pressure / density changes in the process
- SIL2 according to IEC 61508, in homogenous redundancy up to SIL3



Applications in the Water/Waste Water Industry



Level measurement in water/waste water applications

- Fast menu guided commissioning in national languages
- Big variety of housings for all environment conditions (Plastic, stainless steel, aluminum) and sensor concepts
- Multi-Echo Tracking offers safest evaluation
- Accuracy up to $\pm 2\text{mm}$ for accurate measurement
- Reduced stock keeping expenses due to platform spare part strategy
- Not effected by temperature/ gas compositions/ strong storm velocities
- Devices are IP68/NEMA6P for highest reliability



New offerings with ToF Family



- **Uniform commissioning** in accordance to HMI standard for easiest setup over the new Endress+Hauser devices (Level/Flow,...)



- Developed in accordance to **IEC 61508 (SIL2)**, with homogeneous redundancy **up to SIL3**



- **SW-button proof test** procedure for **WHG/SIL** applications saves costs



- Compliance with all important **NAMUR** guidelines: E.g. for **diagnostics NE107**

- **Quick setup menu** for fast and easy setup



- **HistoROM** simplifies commissioning and enables diagnostic functions

- **Two chamber housing as standard** for comfortable and secure installation



- **Up to 17 languages**, for easy local commissioning



- **Optical display** for operation from outside, for secure onsite commissioning without opening the device

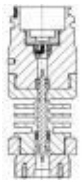


- Highest reliability due to **innovative Multi-Echo Tracking**

What will be new with the Micropilot FMR5x family



- The new basic devices **FMR50/56** liquid/solid
New 100mm/4" plastic horn included up to 40m (FMR50)/30m (FMR56)



- **FMR51** with XT/HT version up to 250°C (482°F)/450°C (842°C)
with gastight feedthrough (second line of defense)



- **FMR57** with HT version up to 400°C (752°F)
- **FMR54** with planar antenna esp. for stilling well applications



- Optional 4-wire AC or DC versions for Micropilot
- New I/O-Modules (switch output or two 4...20mA outputs)



- Heavy duty stainless steel housing



- Plastic housing as basic version

Micropilot family



Safe

- Hardware and software developed according to IEC 61508, SIL2 for single device and SIL3 in homogenous redundancy
- High temperature and high pressure versions
- Gastight feedthrough as second line of defense

Precise

- Dynamic algorithms
- Multi-Echo Tracking
- Accuracy $\pm 2\text{mm}$

Efficient

- Intuitive operating concept
- HistoROM – data management
- Seamless system integration
- Exact instrument and process diagnosis

Appendix

