

ROSEN

empowered by technology

ROSEN EMAT Flowmeter

Insonify your flow

A new Ultrasonic approach



Rosen Group

- **Founded 1981 by Hermann Rosen in Germany (Lingen)**
- **Today active in three business fields:**
 - **Asset Integrity Management (global no. 1)**
 - **Enhanced Materials**
 - **Process Control**
- **20 locations worldwide with**
 - **6 international R&D centers**
 - **Global Headquarter in Switzerland (Stans)**
- **3500 employees from 57 nationalities**



EMAT flow meter

Unique non-intrusive device to measure...

Gases



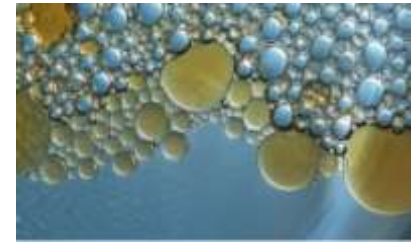
Liquids



Steam



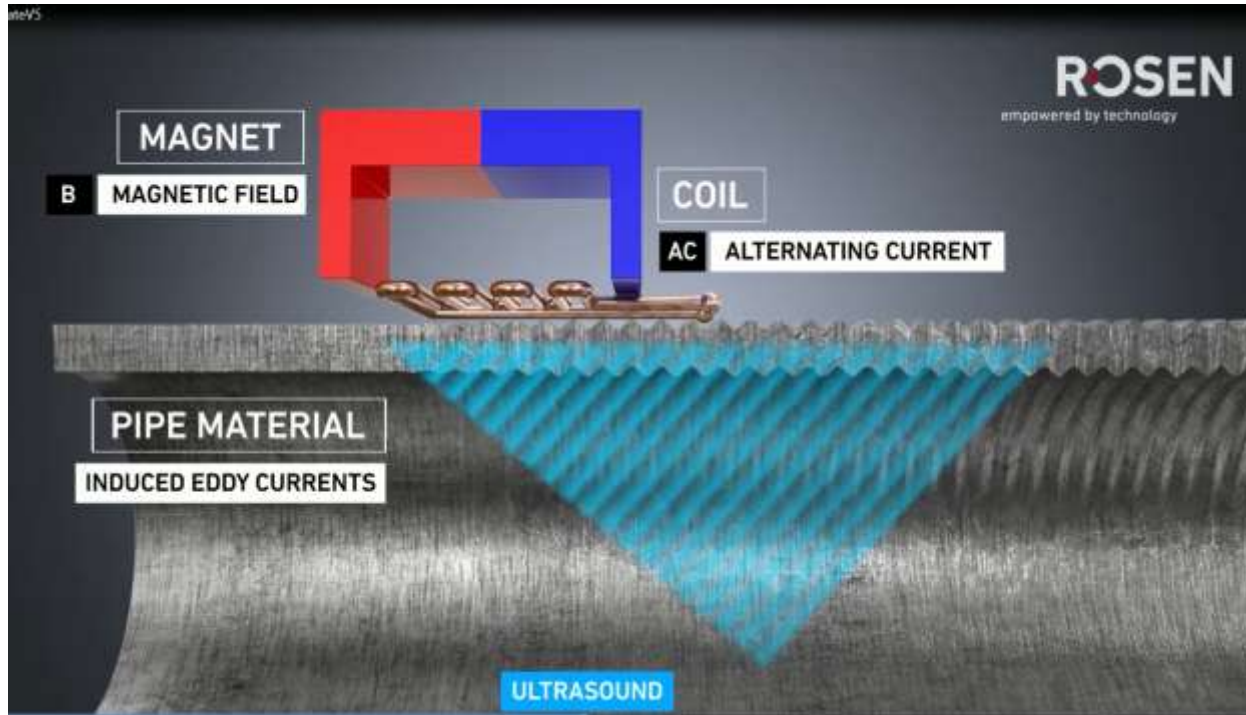
Multiphase



...capable to handle extreme conditions with a very simple installation and robust operation behavior.



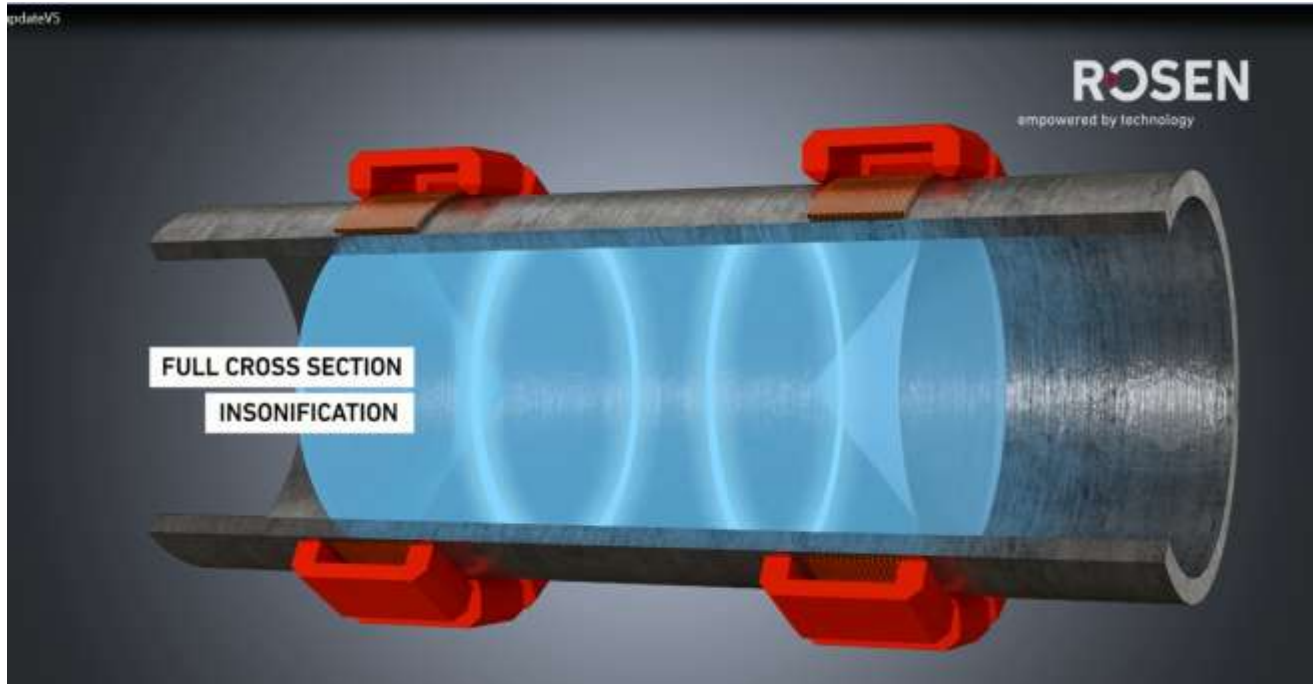
Insonify your flow



EMAT:
Electromagnetic acoustic transducer

Guided wave ultrasound generation in pipe wall on the transit-time-principle

Insonify your flow



**EMAT
Insonification
technology:**

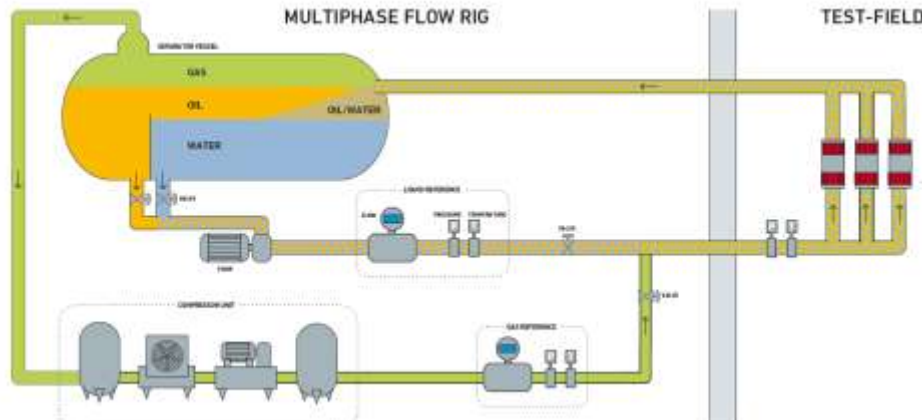
Full flow volume
insonification
between sender
and receiver.

Applications

Media	Feature	Applications
Liquid flow	High temperature Low temperature	Heat Transfer LNG Aggressive media
Gas flow	Low pressure High accuracy	Flare Gas Gas Distribution
Steam flow	High temperature	Steam distribution Power generation
Multiphase flow	Inhomogeneous Media	Watercut, Wet Gas, Multiphase, Slurry



Multiphase Flow rig



TECHNICAL SPECIFICATIONS

Separator vessel size:	32m ³
Media:	Water (salted), Diesel, Nitrogen
Liquid flow rate:	0 - 100 m ³ /h
Gas flow rate:	0 - 1440 Sm ³ /h
Feed line diameter:	3"
Pressure:	5 - 15 bar



HORIZONTAL FLOW REGIMES



BUBBLE FLOW



FLOW FLOW



STRATIFIED FLOW



WAVY FLOW



SLUG FLOW



ANNULAR FLOW

VERTICAL FLOW REGIMES



BUBBLE FLOW



CHURN FLOW



SLUG FLOW

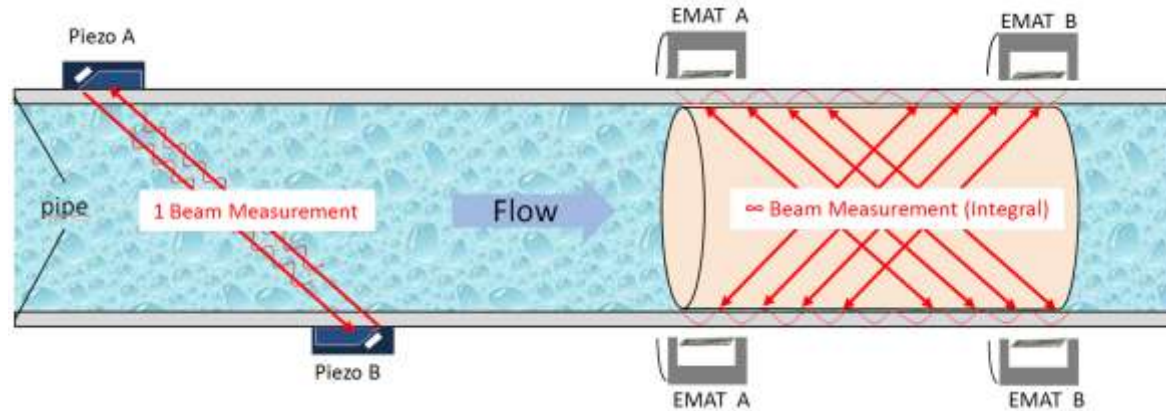


CHURN FLOW

ANNULAR FLOW



EMAT versus conventional Clamp on



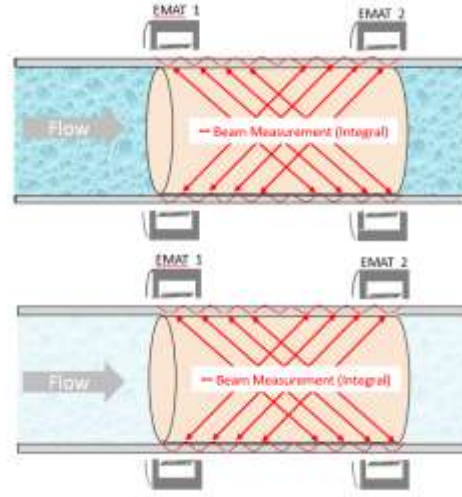
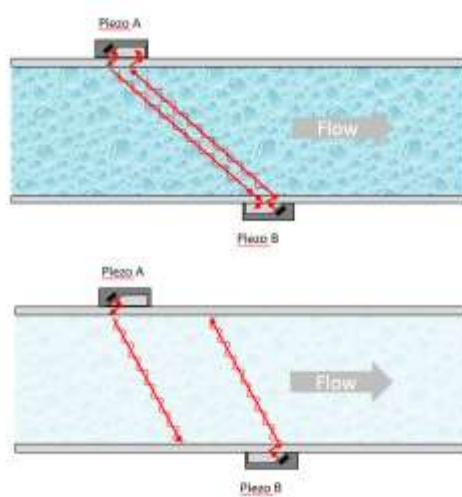
- Higher accuracy and robustness due to 3D insonification instead of single beam
- Simple clamp-on installation without any pipe preparation nor coupling media
- Automatic set-up, no need for sensor alignment
- No “beam blowing” effect at high gas/ steam flow velocity
- High temperature applications possible with EMAT



Covering huge temperature range

A change in temperature leads to a change sound velocity
=> refraction angle changes

A fixed installation resp. ultrasonic generation angle cannot compensate this
=> No measurement



EMAT can be used upon 600°C, also managing varying temperatures

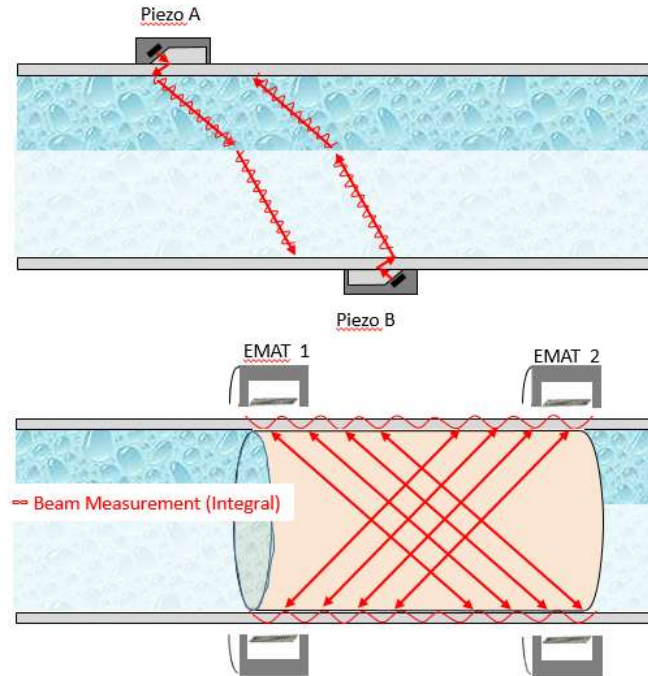


Insonification

A change in phase =>
refraction angle
changes

Each change from n_e
medium/phase to
another

=> Refraction angle
changes



Performance

EMAT flowmeter have been certified by

- PTB Braunschweig, (German national metrology institute) with standard multipoint calibration for the media water and air.
- German chemical industry leader calibration rig

Measurement accuracy:
+/- 0.5 % of measured value

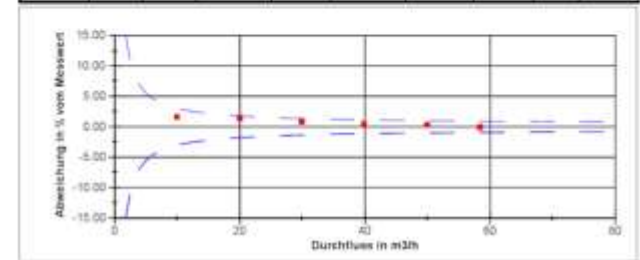


Messwertausdruck zur Werkskalibrierung

Prüfer:		Datum:	02.11.2016
Geeichung:		Uhrzeit:	14:55
		Streckener:	4
		Fluidelement:	Wasser
Prüfung:	Volumenstrom	Referenzgerät:	Konze Optimum 3201 SA/3180272
Hersteller:	Hersteller selbst	Referenzgerät:	Konze Optimum 3201 SA/3180272
Typ:		Messgröße:	m³/h
Serien-Nr.:		Zustandswert:	00/7h
Anschlußart:	1/2 Zoll mit passiv	Endwert:	00/7h
Anschlußdruck:			
Equip-Nr.:			

Messwerte:

Prüfunkt.	Prüfwert m³/h	Messwert m³/h	Wert Wasser kg	Wert Prüfnormal kg	Mittelwert Prüfung 1 m³/h	Abweichung Ausgang 1 m³/h	Abweichung Ausgang 2 m³/h	Druck bar	Temperatur °C
1	10000.00	91.35	0.00	10000.00	10154.15	1.55	2.62	25.94	
2	20000.00	192.45	0.00	19999.77	20300.94	3.02	2.80	25.71	
3	30000.00	281.80	0.00	30002.71	30777.35	7.55	2.60	25.79	
4	40000.00	361.20	0.00	39975.46	40562.24	5.04	2.50	25.63	
5	50000.00	440.50	0.00	49922.48	50751.87	7.37	2.60	25.53	
6	60000.00	519.20	0.00	59471.82	60475.00	4.80	2.50	25.56	



1) Alle Referenzgeräte, die zur Durchführung der Kalibrierung genutzt werden, sind kalibriert und erhalten eine Rückverfolgung auf nationale Metrien.



Thermo oil application

Application	Thermo-oil energy / flow measurement for pyrolysis system
Customer	Engineering company in Austria
Media	Thermo-oil
Pipe	DN50 Carbon steel pipe
Conditions	130° C to 250° C , <12 bar
Nominal flow	Nominal flow rate 15m ³ /h



Multiphase and Steam flow measurement



Questions

Unique non-intrusive device to measure...

Gases



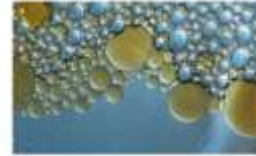
Liquids



Steam



Multiphase



...capable to handle extreme conditions with a very simple installation and robust operation behavior.



If you need more information

- www.rosen-group.com/flowmeter
- Info at flowmeter@rosen-group.com
- Technical animation on YouTube:
<https://www.youtube.com/watch?v=hLIOrIm7x9A>
- Rosen EMAT flowmeter promoted in the Netherlands by

21st of September visit to ROSEN

ROSEN

empowered by technology

ODS Metering Systems

klöckner & co

