

Attracting Tomorrow

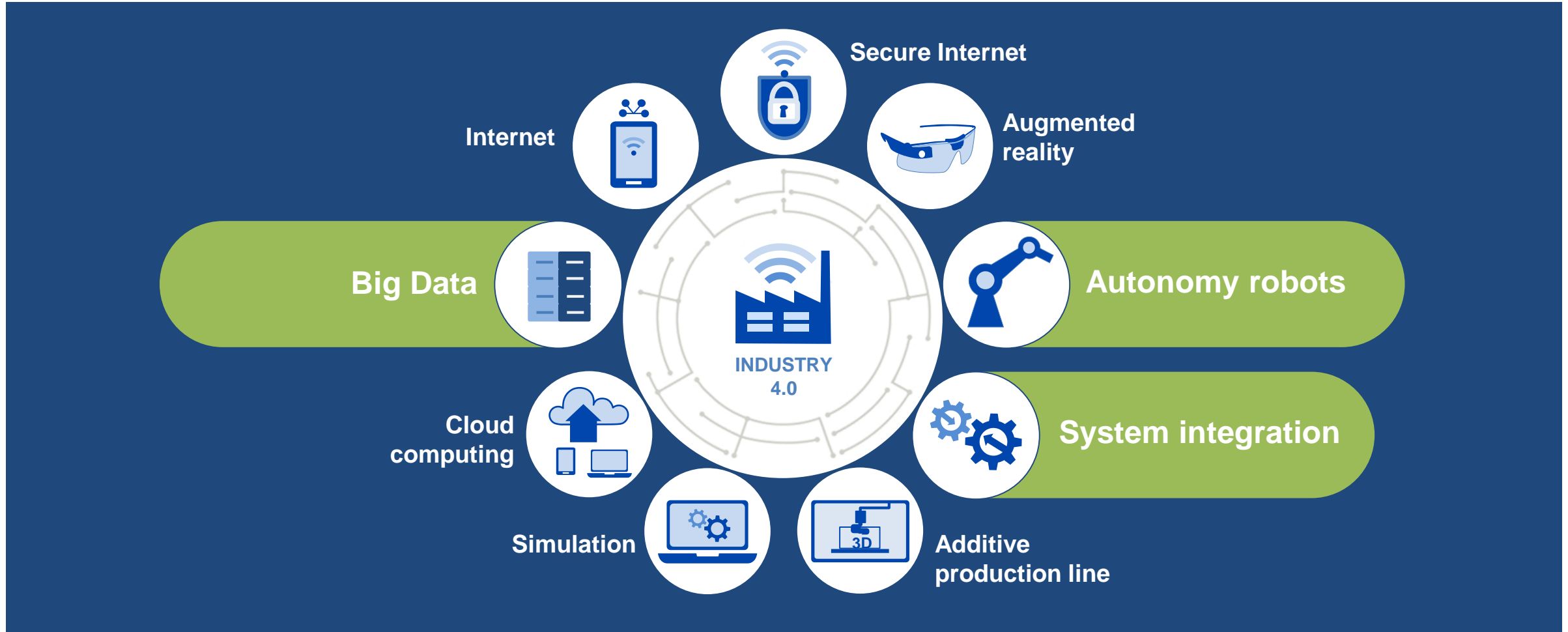


# Low-profile pressure transmitters for industry 4.0

Technologies & Products Press Conference 2019

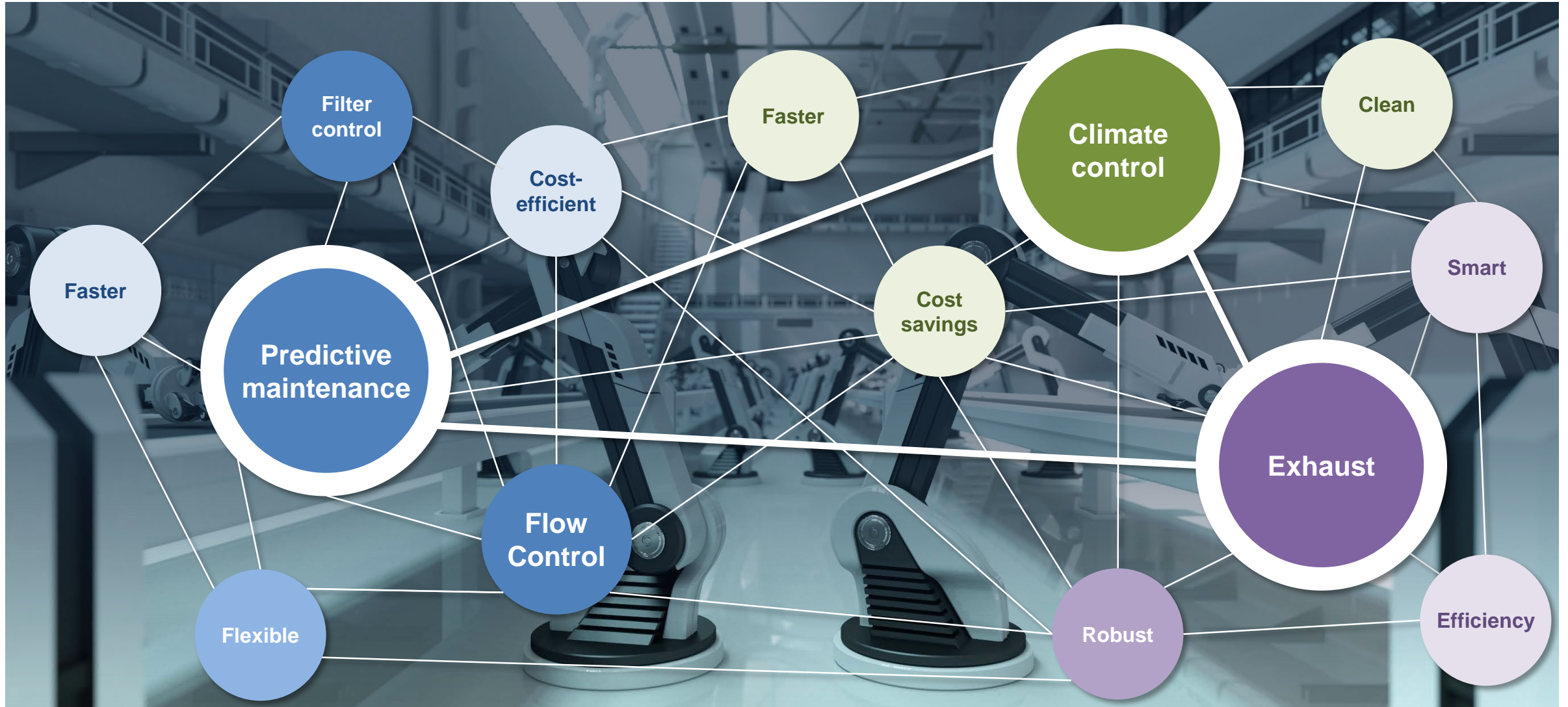
**Martin Reckziegel**  
Product Marketing Pressure Sensors  
Temperature & Pressure Sensors Business Group  
October 2019

# Enhanced requirements for industry 4.0

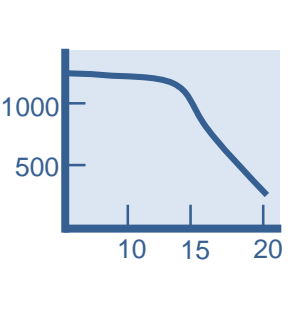
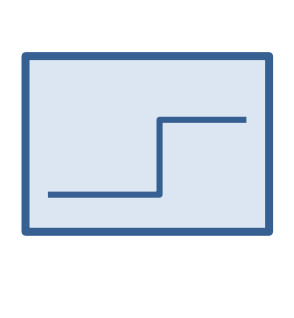
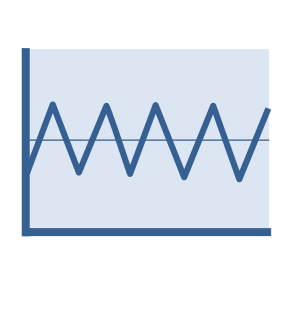
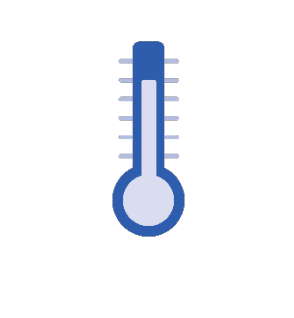
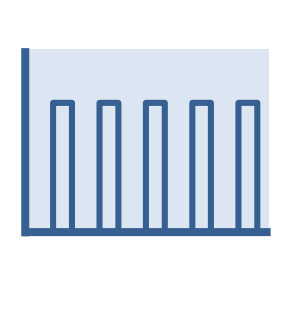
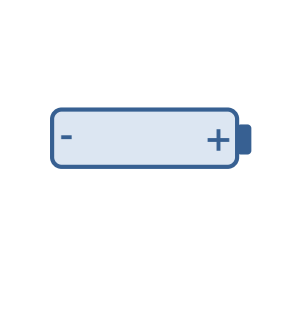
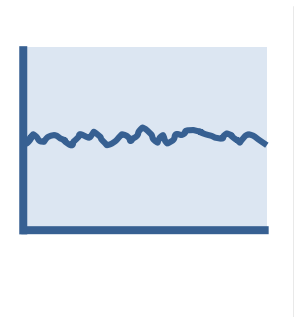



**Higher requirements for low-profile and more accurate pressure sensors**

# New application areas in production process control



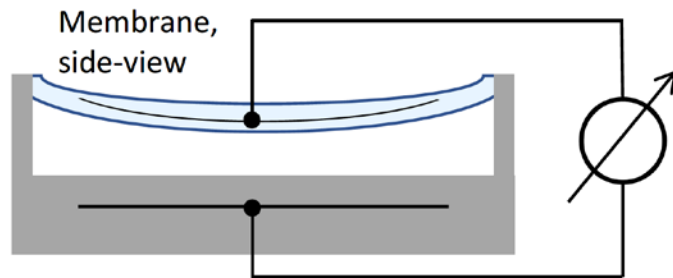
# Key performance parameters for industry 4.0 applications

Absolute accuracy (mbar)	Relative Accuracy (mbar/bar)	Temperature hysteresis	Temperature coefficient (mbar/C)	Output data rate (Hz)	Power ( $\mu$ A)	Noise (Pa RMS)	Environmental compatibility
							
<b>Total long-term signal deviation</b>	Short-term signal deviation between two pressures	<b>Signal offset due to temperature stress on the package</b>	<b>Pressure output sensitivity to temperature</b>	Data per second	Sensor current consumption at 1 Hz ODR	Variation in sensor output at constant condition	<b>Stability during contact with water and chemical compounds</b>
<b>i4.0</b>		<b>i4.0</b>	<b>i4.0</b>				<b>i4.0</b>

# Advantage of piezoresistive pressure sensors for industry 4.0

## Capacitive

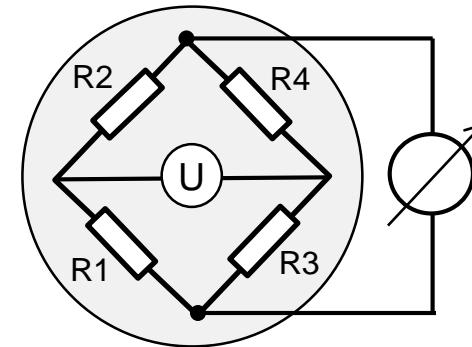
Suitable for consumer applications



**Directly convert diaphragm stress to electrical signal**

## Piezoresistive

Suitable for automotive and industrial applications



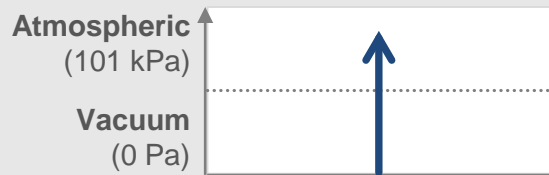
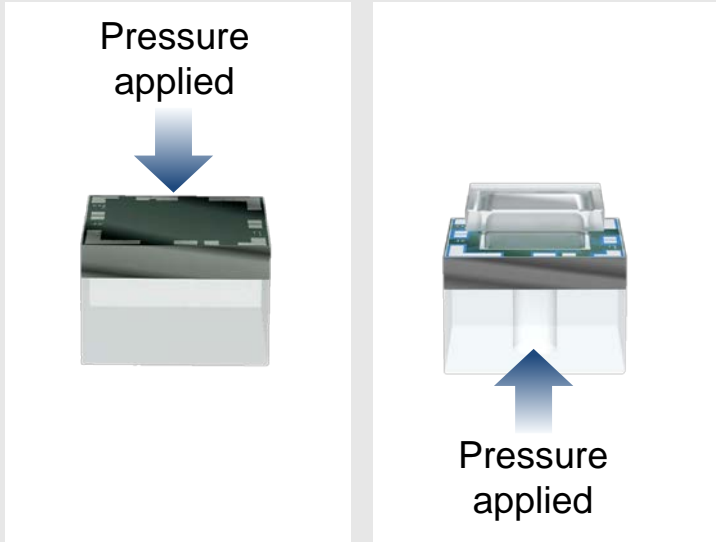
**Directly convert diaphragm deflection to electrical signal**

**Piezoresistive pressure sensors ensure longtime stability due to**

- High absolute accuracy
- No temperature hysteresis
- Good temperature coefficient
- Environmental compatibility

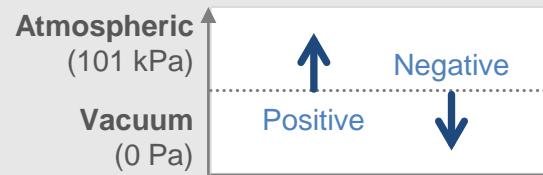
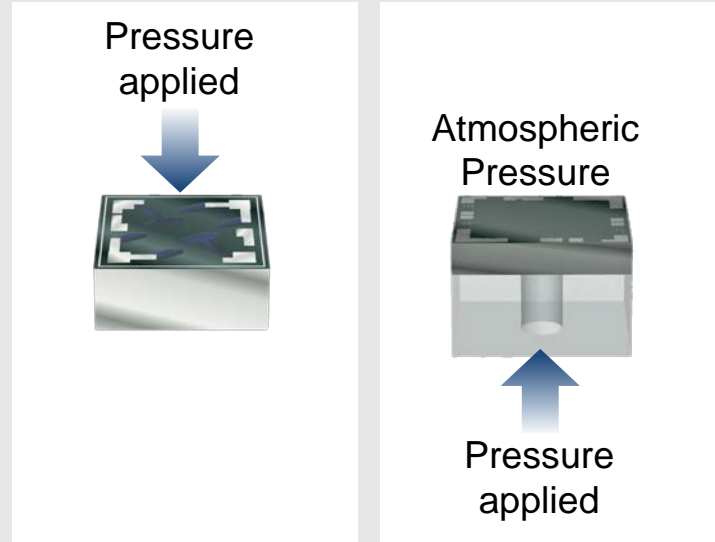
# Piezoresistive pressure sensing methods

## Absolute



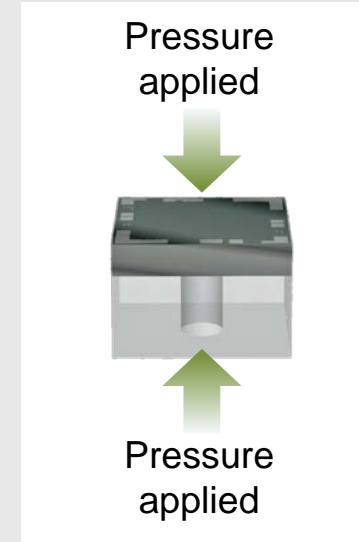
e.g. for automotive applications

## Gauge



e.g. for home appliances

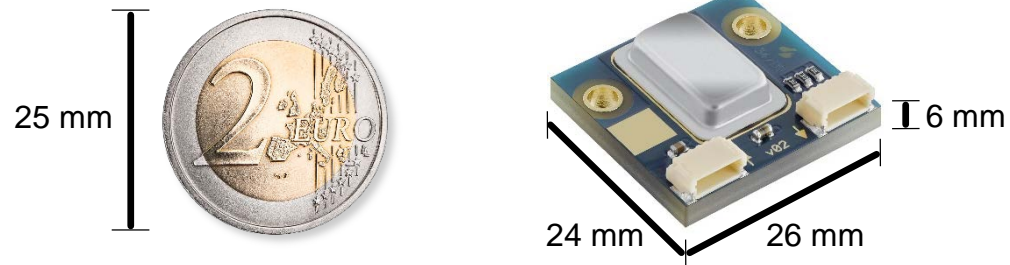
## Differential



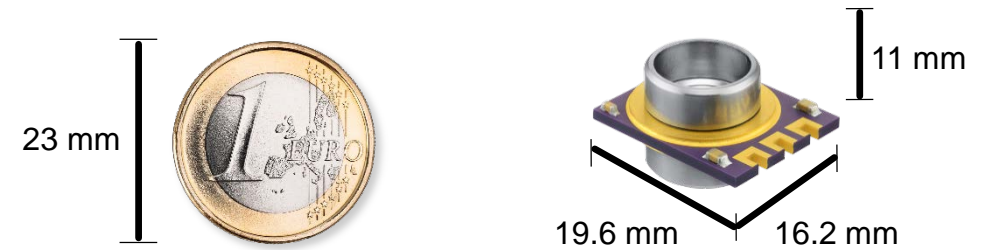
e.g. for predictive maintenance and process control

## Low-profile pressure transmitter

NEW



## MiniCell® pressure transmitter



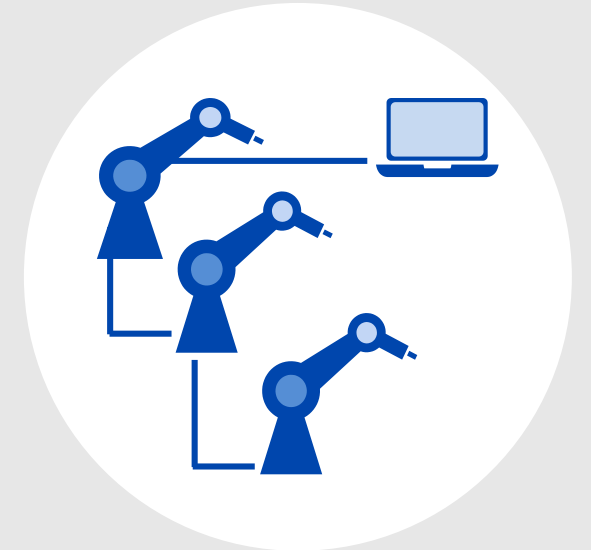
High-performance pressure sensors combine miniaturized package and outstanding long-term stability

# Low-profile pressure transmitter with digital interface



NEW

Accuracy	±1 % FS
Max. rated pressures	16 mbar to 7 bar
Operating temperature	-25 °C ≤ T <sub>OP</sub> ≤ +85 °C
Digital interface	SPI
Resolution	16 bit



## High-performance sensor

- High mechanical robustness
- High accuracy at low pressures
- Excellent “absolute pressure” accuracy

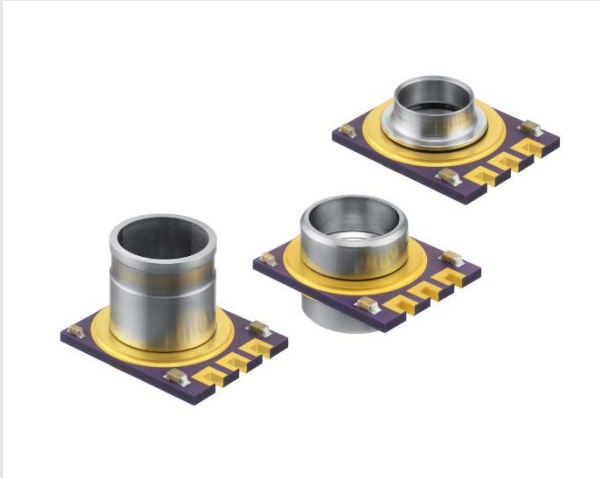
## Simplified integration

- Miniaturized and low profile
- No tubes required
- Easy screw-on mounting

## Benefits for industry 4.0

- Fast data acquisition
- Suitable for integration in sensor topologies (daisy chain)





Accuracy	<1.5 % FS
Max. rated pressure	0.5 to 10 bar
Operating temperature	$-40\text{ °C} \leq T_{OP} \leq +140\text{ °C}$



## High-performance sensor

- Robust design
- High accuracy over full temperature range and lifetime
- Adaptable pressure range
- Long-term stability

## Simplified integration

- Miniaturized design
- Low insertion height

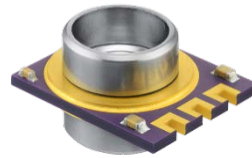
## Benefits for industrial applications

- Hermetically sealed electronics with oil-filled and media-separated sensor cells
- High media resistance thanks to stainless steel membrane
- Wide temperature range

# Advanced pressure sensing platform for industry 4.0



**MiniCell®  
pressure  
transmitter**



**Low-profile  
pressure  
transmitter**



**Flat designs with both  
analog and digital output**





[www.tdk-electronics.tdk.com](http://www.tdk-electronics.tdk.com)