

# Customized Pressure Sensors and Components

Made by Endress+Hauser



# High quality for your application and products

The development of technical products and devices is becoming increasingly complex. Companies who wish to develop innovative products quickly and cost-effectively must overcome this complexity. In so doing, they must be able to rely on suppliers of critical process components for their end products. A technology partnership with Endress+Hauser's customer-specific sensor and component division allows you to concentrate fully on your core product.

We will supply the correct pressure sensor. We will be at your side from the initial idea to the consulting phase and joint development effort, through to the manufacture of prototypes and finally series production in the required quantities. Release and approval processes as well as the required certification are key elements of our comprehensive service.

## Our role as your technology partner

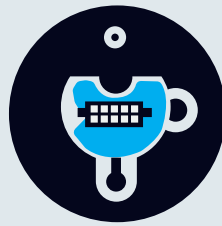


### Engineering

Maximum transparency thanks to clearly defined specifications, deadlines and costs

Project planning and management by our experts in accordance with agreed framework requirements

Advice and support services worldwide



### Prototypes and testing

Extensive tests in Endress+Hauser's laboratories: Software and hardware tests, checks to verify mechanical, climatic and electrical integrity (EMC, climate, vibrations)

We create and optimize functional prototypes quickly in our modern technology laboratories

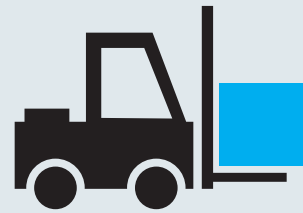
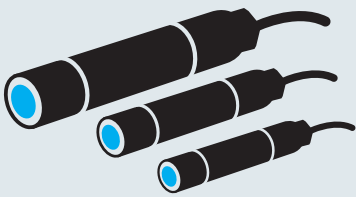
Engineering geared towards industrial production: The pressure sensor must be easily integrated into your application

Preemptive measures to ensure that timeconsuming and costly development and design corrections are avoided



### Certification

Guide our customers through the release and approval process based on experience from our core industries



## Serial production

## Review

## Optimum supply chain

Maximum quality and product safety as sensors are produced under clean room conditions

High level of automation ensures high and consistent quality

Coordinated purchase quantities and batch sizes

Complete traceability of core components

Zero-defect strategy in serial production:  
Testing of all the individual components as well as the end product

Just-in-time delivery and in the quantity required by the specified deadline

Support for the entire logistics chain worldwide and customer-specific supply-chain concepts

# Capacitive Ceramic Sensor:

## Our basic technology for your success

Constituting the „heart“ of pressure instruments, the Ceracore capacitive ceramic measuring cell guarantees cost effective, reliable and safe process control in millions of Endress+Hauser pressure instruments and customized applications. The new measuring cell offers an even better performance, more flexible adaptation to your application and configuration capabilities in line with your application. The new generation of the Ceracore measuring cell guarantees safe measurements and special stability through:

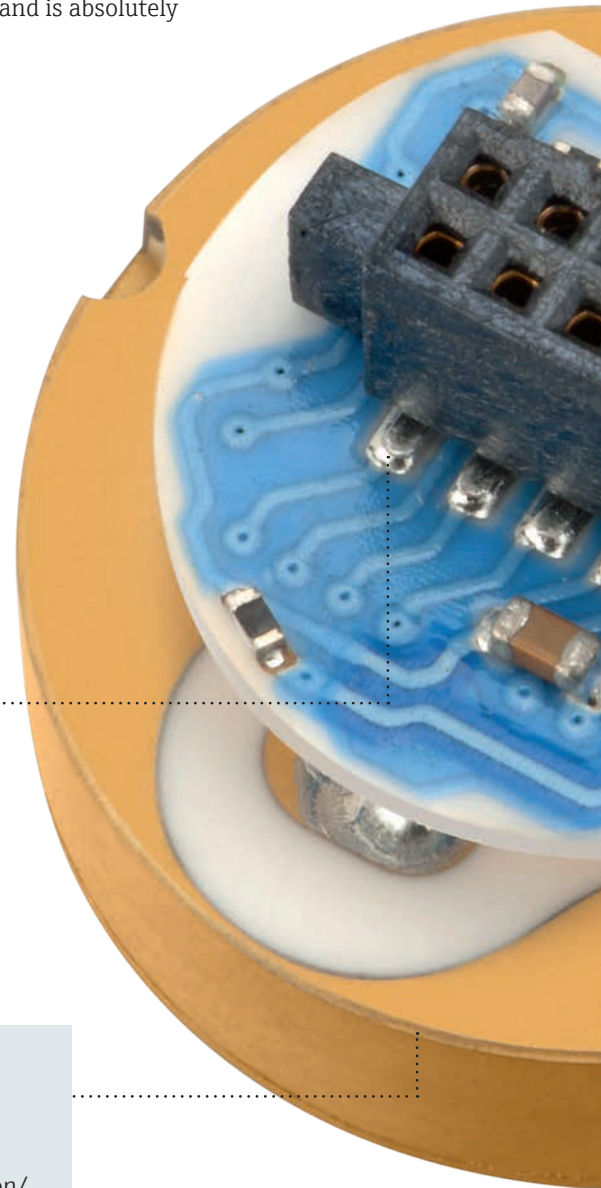
- Patented metallic active solder connection of sensor substrate and diaphragm
- Metallic coating of the sensor substrate for improved EMC and reduced installation sensitivity
- Produced of ultra pure ceramics (99.9%  $\text{Al}_2\text{O}_3$ ), highly resistant against the most varied process media and chemically neutral
- The Ceracore dry measuring cell does not use any oil for pressure transmission and is absolutely vacuum resistant
- Highest overload resistance
- Linearized and temperature-compensated output signal
- Low measuring ranges possible
- Reference accuracy 0.1%

### Safety

- Self-monitoring measuring cell for the highest degree of safety
- Communication via safe protocols
- Good EMC resistance
- Approval capability, e.g. ATEX
- RoHS conformity
- FDA-listed materials

### Application-specific configuration

- Sensor preconfigured at the factory (damping, turn-down, measuring range, ...)
- Adjustable measuring rate for optimum resolution/ power consumption
- Option of configuration by customer
- Additional output of temperature signal
- Power consumption < 1.6mA
- Different design sizes (diameters: 17.5mm and 32.4mm)



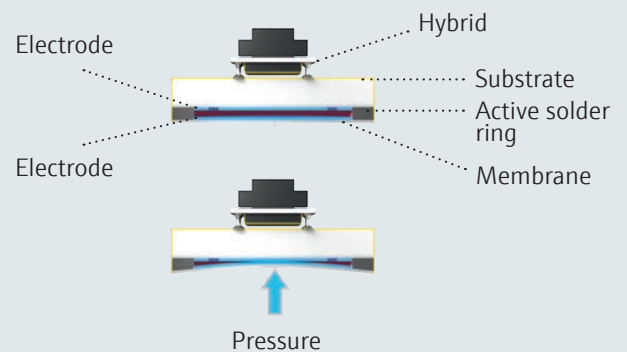
### Communication

- Analog output signal
  - Voltage output ratiometric
  - Voltage output absolut
- Digital output signal
  - SPI interface
  - UART interface
- Digital and analog output signal may be combined
- Switching output
- Temperature output

### Technology

It is based on the capacitive measuring principle. The substrate and the membrane serve as components of a capacitor. If pressure is applied to the sensor, the distance between the two electrodes changes due to the deflection of the membrane. This leads to a change in capacitive which is converted into an electric output signal via evaluation electronics.

#### Sensor cross section



# The MySensor concept: Your customized pressure transducer

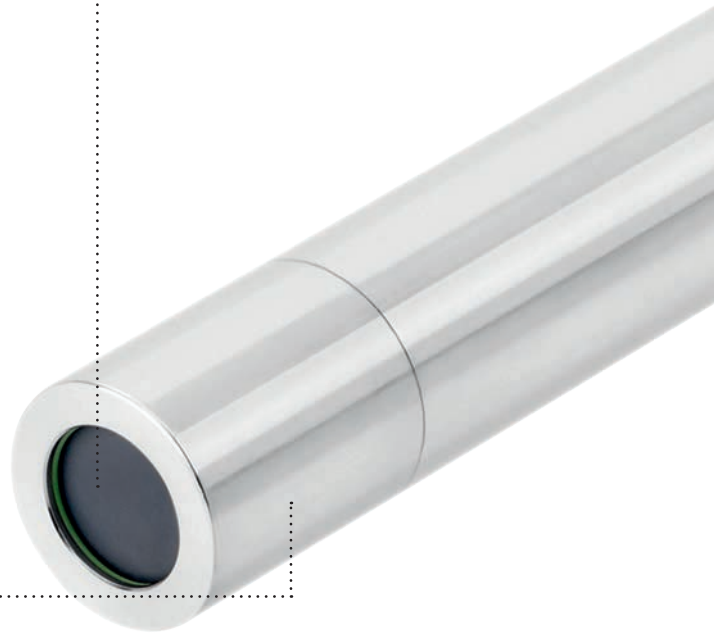
Make use of the advantages of the ceramic measuring cell in your customized pressure transducer. You have numerous possibilities of combining the measuring cell with customized electronics, housing designs, process and electric connections – entirely according to your requirements. Make use of the modular design options and run through a first rough configuration with our MySensor configurator. Only a few clicks, and you will receive a sensor in line with your ideas. On basis of this first configuration, we will then develop the final pressure transducer together with you.

## Process adaption

You may choose from all common process connections and the most varied sealings. The completed pressure transducer must finally fit into your product. We help you to achieve this objective. There are almost no limits in relation to the external form of the pressure sensor.

## Measuring range

Employing technology, you can measure pressure ranges from 100mbar to 100bar of absolute or gauge pressure. A number of standardized measuring ranges are available within the 100bar range. Customized measuring ranges may be set. The performance of the measuring cell can be adjusted to your application – you get what you need.





### Electric connection

You may choose from different connection options (plug/cable). Select also from the various output signals - be they analog or digital, your requirement is decisive.

### Additional options

In many industries, certification plays a decisive role. Select from different certification options and order final inspection protocols, certificates and documentation.

### The configurator

You configure your pressure sensor with just a few clicks. Make use of our online configurator for your first selection.

[www.sensors-components.endress.com/en/configurator](http://www.sensors-components.endress.com/en/configurator)



# Capacitive ceramic pressure sensors: USC30 und USC70

Ceracore USC30 and USC70 form the basis of all customized pressure transducers. They differ in the size of the measuring cell and thus the dimensions of the completed pressure transducer. You naturally also have the option of developing the housing and process connections yourself. In that case, we would be pleased to supply our capacitive ceramic pressure sensors configured according to your specifications.

## Ceracore USC30

Capacitive ceramic pressure sensor for absolute and gauge pressure measurement.

### Design size

- 17.5mm external diameter

### Standardized measuring ranges:

- 0...100mbar / 10kPa / 1.5psi, overload range: 4bar / 400kPa / 60psi
- 0...200mbar / 20kPa / 3psi, overload range: 5bar / 500kPa / 75psi
- 0...400mbar / 40kPa / 6psi, overload range: 6bar / 600kPa / 90psi
- 0...1bar / 100kPa / 15psi, overload range: 10bar / 1MPa / 150psi
- 0...2bar / 200kPa / 30psi, overload range: 18bar / 1.8MPa / 270psi
- 0...4bar / 400kPa / 60psi, overload range: 25bar / 2.5MPa / 375psi
- 0...10bar / 1MPa / 150psi, overload range: 40bar / 4MPa / 600psi
- 0...20bar / 2MPa / 300psi, overload range: 40bar / 4MPa / 600psi
- 0...40bar / 4MPa / 600psi, overload range: 60bar / 6MPa / 900psi
- 0...100bar / 10MPa / 1500psi, overload range: 150bar / 15MPa / 2,250psi\*

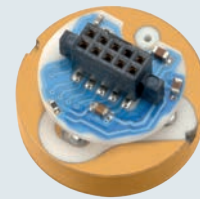
\* in preparation

### Operating conditions

- Ambient/process temperature: -40 to +125°C
- Storage temperature: -40 to +125°C

### Output signal and energy supply

- Supply voltage: 2.9 to 5.5 V DC
- Power consumption: < 1.6mA
- Ratiometric or absolute analog output signal
- Digital interface: UART or SPI
- Pressure signal: 24 bit
- Temperature signal (optional): 16 bit
- Measuring rate: 1.25 to 80ms
- Reference accuracy: 0.1%



Due to their small design size, the pressure transducers find a wide field of use in medical and laboratory engineering as well as hydrostatic level measurement.



Variant examples of USC30 with Ceracore USC30



### Ceracore USC70

Capacitive ceramic pressure sensor for absolute and gauge pressure measurement.

#### Design size

- 32.4mm external diameter

#### Standardized measuring ranges

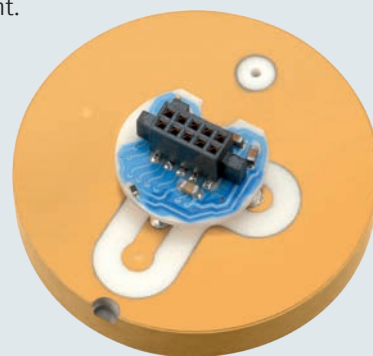
- 0...100mbar / 10kPa / 1.5psi, overload range: 4bar / 400kPa / 60psi
- 0...250mbar / 20kPa / 3psi, overload range: 5bar / 500kPa / 75psi
- 0...400mbar / 40kPa / 6psi, overload range: 8bar / 800kPa / 120psi
- 0...1bar / 100kPa / 15psi, overload range: 10bar / 1MPa / 150psi
- 0...2bar / 200kPa / 30psi, overload range: 18bar / 1.8MPa / 270psi
- 0...4bar / 400kPa / 60psi, overload range: 25bar / 2.5MPa / 375psi
- 0...10bar / 1MPa / 150psi, overload range: 40bar / 4MPa / 600psi
- 0...40bar / 4MPa / 600psi, overload range: 60bar / 6MPa / 900psi

#### Operating conditions

- Ambient/process temperature: -40 to +125°C
- Storage temperature: -40 to +125°C

#### Output signal and energy supply

- Supply voltage: 2.9 to 5.5 V DC
- Power consumption: < 1.6mA
- Ratiometric or absolute analog output signal
- Digital interface: UART or SPI
- Pressure signal: 24 bit
- Temperature signal (optional): 16 bit
- Measuring rate: 1.25 to 80ms
- Reference accuracy: 0.1%



The pressure transducers find a wide field of use in the areas of process instrumentation, industrial instrumentation and environmental engineering. Variants capable of approval are available for use in hazardous areas.



Variant examples with the Ceracore USC70 measuring cell

# The solution for differential pressure applications: customized pressure transducer UTD20

Hydrostatic level measurement in pressurized tanks requires a differential pressure sensor. Our customized UTD20 pressure transducer offer a number of advantages for you. The integrated digital compensation for pressure and temperature offers a ready-to-fit option for signal evaluation in non-hazardous liquid tanks (CO<sub>2</sub>, O<sub>2</sub>, nitrogen, etc.).

- Measuring ranges: 0...1.5bar
- Measuring range and zero point can be set
- Accuracy: < ±0.5% of the nominal range (total performance)
- Operational range: -40 to +85°C
- Materials in contact with the process: Stainless steel 316L
- Long-term stability: ±0.2% FS
- Over pressure: 40bar
- Supply voltage: 2.9 to 5.5 V DC

## Safety

- Communication via safe protocols (UART)
- Improved EMC
- System without any sealings

## Application-specific configuration

- Sensor preconfigured at the factory (attenuation, turn-down, measuring range ...)
- Adjustable measuring rate for optimum resolution/ power consumption
- Option of configuration by customer
- Additional output of temperature signal
- Current consumption < 2mA



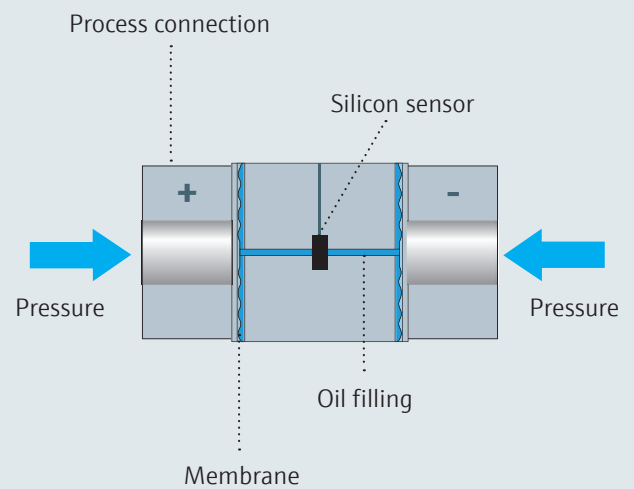


#### Communication

- Output signal
  - Analog ratiometric
  - Digital UART
- Integrated switching signal

#### Technology

A filling oil transfers the pressure to a resistance circuit bridge (semiconductor technology). The differential-pressure-dependent change of the bridge output voltage is measured and further processed.



#### Additional options

- Cleaned for oxygen service

# The differential pressure sensors: USD50 and USD70

The differential pressure sensors USD50 with piezo resistive sensor and welded metal membrane are used in process and environmental industries. They measure level, volume and mass in liquids as well as differential pressure in e.g. filters and pumps as well as in flow applications (volume and mass flow).

## Deltacore USD50

Silicon differential pressure sensor, uncompensated bridge output signal with cable connection.

- Measuring range 10mbar to 40bar
- Bridge output signal (mV/V)
- Highest accuracy, reproducibility and long term stability
- High overload resistance of 160/420\*bar (one side) 240/630bar\* (both sides)
- 316L Version
- Different membrane materials and filling oils\*

### Design size

- Ø 55 mm X 40 mm

### Standardized measuring ranges

- 0...10mbar / 1kPa / overload range: 1,000mbar (one side), 1,500mbar (both sides)
- 0...30mbar / 3kPa / overload range: 1,000mbar (one side), 1,500mbar (both sides)
- 0...100mbar / 10kPa / overload range: 160bar (one side), 240bar (both sides)
- 0...500mbar / 50kPa / overload range: 160bar (one side), 240bar (both sides)
- 0...1bar / 100kPa / overload range: 160bar (one side), 240bar (both sides)
- 0...3bar / 300kPa / overload range: 160bar (one side), 240bar (both sides)
- 0...16bar / 1.6MPa / overload range: 160bar (one side), 240bar (both sides)
- 0...40bar / 4MPa / overload range: 160bar (one side), 240bar (both sides)

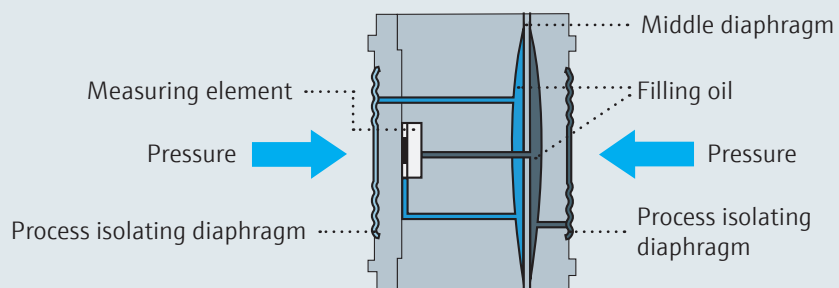
For measuring ranges from 100mbar a higher overload range is optional: 420bar (one side), 630bar (both sides) optional

### Operating conditions

- Ambient/process temperature: -40 to +85°C
- Storage temperature: -40 to +85°C

### Output signal and energy supply

- Recommended:  
Constant current feed, <1mA
- Bridge resistance:  
4.3...5.6kΩ (25°C)
- Output signal:  
22...55mV/V (span)



The differential pressure sensors are the base for the design and construction of high quality differential pressure transmitters. The sensors are uncompensated and can be compensated and calibrated at customer site.

\*optional



The differential pressure sensors USD70 are available with small measuring ranges and extremely high overload resistance. The piezo resistive sensors with welded metal membrane are used in process and environmental industries. They measure level, volume and mass in liquids as well as differential pressure in e.g. filters and pumps as well as in flow applications (volume and mass flow).

#### Deltacore USD70

Silicon differential pressure sensor, high overload resistance, uncompensated bridge output signal

- Measuring range 10mbar/30mbar
- Bridge output signal (mV/V)
- Highest accuracy, reproducibility and long term stability
- High overload resistance of 160/420\*bar (one side) 240/630bar\* (both sides)
- 316L Version
- Different membrane materials and filling oils\*

#### Design size

- Ø 55 mm X 40 mm

#### Standardized measuring ranges

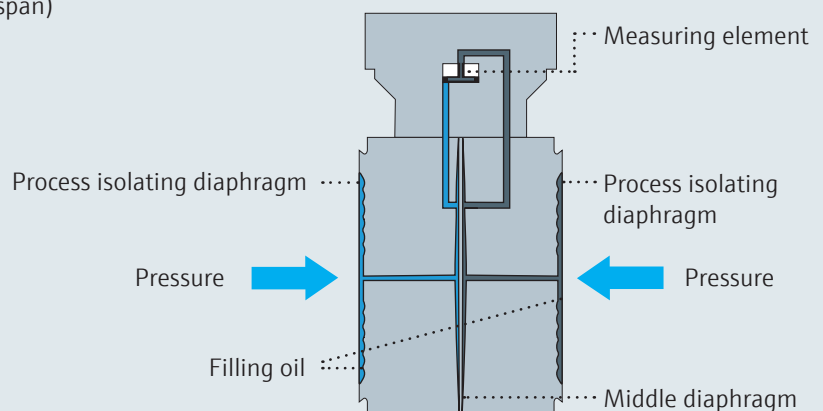
- 0...10mbar / 1kPa / overload range:160bar (one side), 240bar (both sides)
- 0...30mbar / 3kPa / overload range:160bar (one side), 240bar (both sides)

#### Operating conditions

- Ambient/process temperature: -40 to +85°C
- Storage temperature: -40 to +85°C

#### Output signal and energy supply

- Recommended: Constant current feed, <1mA
- Bridge resistance: 4.5...5.6kΩ (25°C)
- Output signal: 10mbar / ±13.8mV/V (span)  
30mbar / ± 25mV/V (span)



The differential pressure sensors are the base for the design and construction of high quality differential pressure transmitters. The sensors are uncompensated and can be compensated and calibrated at customer site.

\*optional

# Applications

## Your specifications count, irrespective of the industry

The high product quality of sensors and components and the pertaining precision and durability reduce costs during the entire life cycle of your product and underline the claim of your products concerning reliability and safety. We are at home, inter alia, in the following industries, have profound knowledge of requirements at our disposal, guarantee safety and offer you qualified support.



Energy



Environment



Ship building



Laboratory/research



Medical





# The Endress+Hauser Group

Endress+Hauser is a global leader in measurement instrumentation, services and solutions for industrial process engineering. The Group employs 14,000 personnel across the globe, generating net sales of more than 2.4 billion euros in 2018.

## Structure

With dedicated sales centers and a strong network of partners, Endress+Hauser guarantees competent worldwide support. Our production centers in 12 countries meet customers' needs and requirements quickly and effectively. The Group is managed and coordinated by a holding company in Reinach, Switzerland. As a successful family-owned business, Endress+Hauser is set for continued independence and self-reliance.

## Products

Endress+Hauser provides sensors, instruments, systems and services for level, flow, pressure and temperature measurement as well as analytics and data acquisition. The company supports customers with automation engineering, logistics and IT services and solutions. Our products set standards in quality and technology.

## Industries

We work closely with the chemical, petrochemical, food & beverage, oil & gas, water & wastewater, power & energy, life science, primaries & metal, renewable energies, pulp & paper and shipbuilding industries. Endress+Hauser supports its customers in optimizing their processes in terms of reliability, safety, economic efficiency and environmental impact.



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