



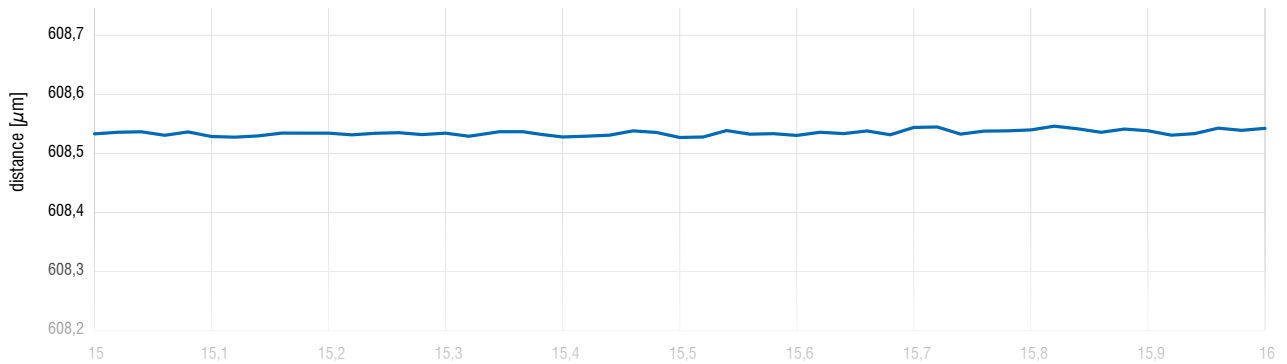
More Precision

capaNCDT // Capacitive sensors for displacement, distance & gap

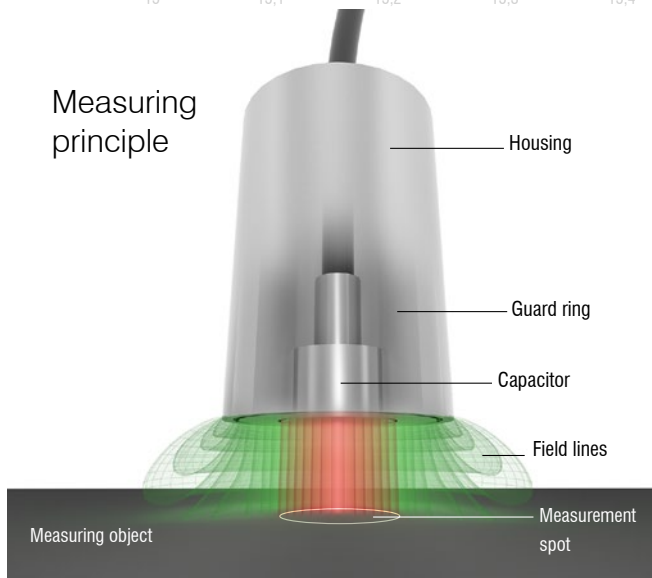


More precision – Capacitive sensors from Micro-Epsilon

capaNCDT



Measuring principle



Advantages of the measuring principle

- Wear-free and non-contact measurement
- Distance and thickness measurements on conductive and non-conductive objects
- Unmatched accuracy and stability
- High frequency response for fast measurements
- Ideal for industrial environments with high and low temperatures, magnetic fields and vacuum

Low-noise technology for maximum precision

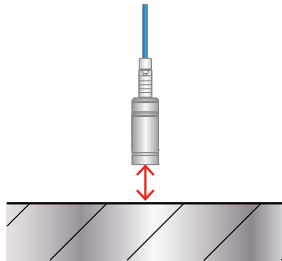
The capaNCDT sensors are based on the principle of the ideal plate capacitor. Two plate electrodes are represented by the sensor and the measuring object. If a constant alternating current flows through the sensor capacitor, the amplitude of the alternating voltage on the sensor is proportional to the distance between the capacitor electrodes. The alternating current is demodulated and output as an analog or digital signal.

Capacitive sensors from Micro-Epsilon are suitable for both clean environments and industrial measurement tasks. The low-noise technology developed by Micro-Epsilon enables measurement results with maximum resolution and outstanding stability.

Wide range of applications

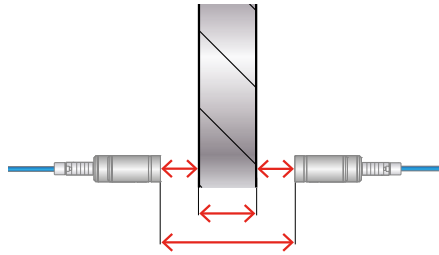
Measurement of distance, thickness and gaps with highest precision

Distance measurement on electrically conductive objects



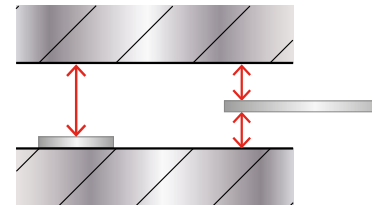
The capaNCDT system measures the capacitive reactance (X_c) of the capacitor, which varies proportionally with the distance.

Thickness measurement of electrically conductive materials



To measure the thickness of electrically conductive materials, two sensors are mounted on opposite sides. Each sensor measures the distance to the surface of the object being measured. The material thickness is simply calculated based on the known distance between the sensors.

Measurement of the gap between electrically conductive surfaces



Gap measurement determines the distance between two electrically conductive materials. The sensor measures the distance from one side to the other, taking its own thickness into account, or - when freely suspended - the distance to both sides, and uses this to calculate the corresponding gap width.

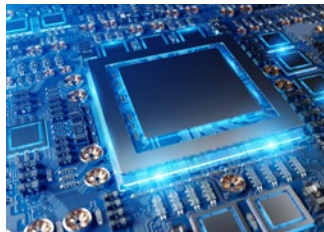
Successful applications in numerous industries

Energy technology



Air gap in the wind power generator

Semicon machine building



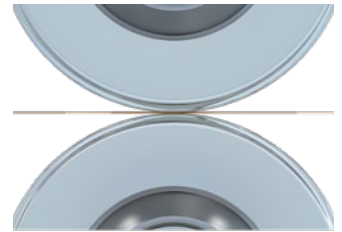
Chip testing systems

Measurement and testing



Creep test

Batteries



Roller gap in battery coating process



Monitoring in cryogenics



Chip bonding



Silicon photonics



Battery film thickness

Extensive variety. Advanced technology. Globally leading.
capaNCDT

Innovative controller technology

- Easy operation via powerful web interface with calculation functions
- Numerous interfaces
- Industrial-grade and customizable

Multi-channel controller

- Modular systems with 1 to 8 channels
- Supports synchronization and calculation
- Non-contact grounding of the target object possible

Controller



capaNCDT 6100
Compact single-channel system

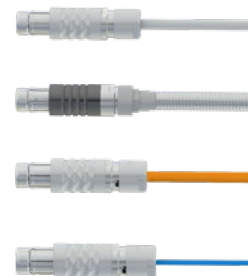


capaNCDT 6200
Modular multi-channel system

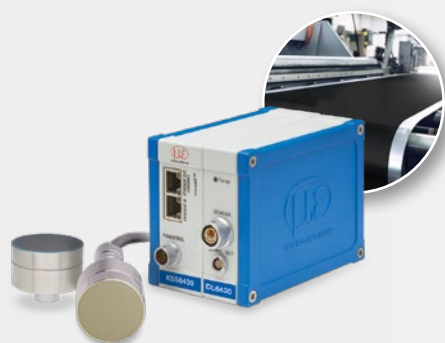


capaNCDT 6500
Multi-channel system for highest resolution

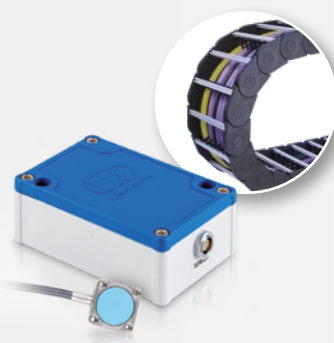
Cables



Application-specific models (more details from page 60)



Coating thickness measurement of films and batteries
combiSENSOR



Active sensors for drag chains and long paths
capaNCDT 6114



Testing system for film thickness
capaNCDT TFG6220

Full compatibility and maximum precision

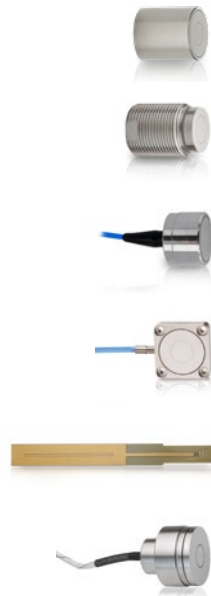
- Sensors, cables and controllers are compatible with each other
- Sensor replacement without re-calibration
- Optional linearity calibration (LC) for even greater precision

The right materials for every requirement – from laboratory to industry

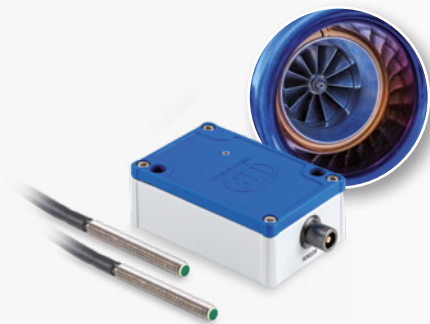
- Particle-free, low-outgassing materials for cleanroom and vacuum applications
- Non-magnetic materials such as titanium and stainless steel for environments with strong magnetic fields
- Robust, temperature-resistant materials: mechanically stable for use at high and low temperatures

Sensors

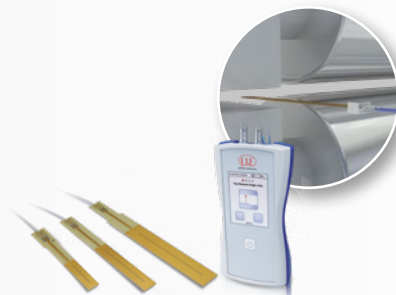
- Max. cable length: 40 m
Standard 1.4 m / 2.8 m
- Industrial cable:
 - Crush-resistant with protective metal tubing
 - EMC resistant
 - Temperature-resistant up to +200 °C
 - Models for drag chain
- Cables for vacuum and cleanroom (low-outgassing)



- Homogeneous measuring field and flush mounting due to additional guard electrode
- Robust sensors for extreme conditions, including cleanroom and UHV
- Ambient temperatures from -270 to +800 °C
- More than 50 standard sensors
- Measuring ranges from 0.05 mm to 10 mm
- Worldwide smallest sensor size
- A wide range of housing designs for every installation situation and mounting type
- Customer-specific modifications and OEM development



Rotational speed measurement
capaNCDT CST6110



Mobile gap measurement
capaNCDT MD6-22



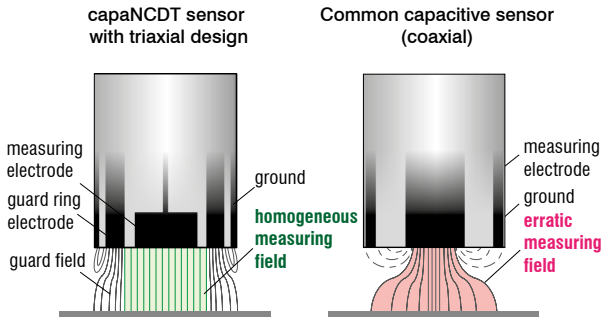
Measurement of the brake disc thickness
capaNCDT DTV

More precision and stability

capaNCDT

✔ Maximum signal stability

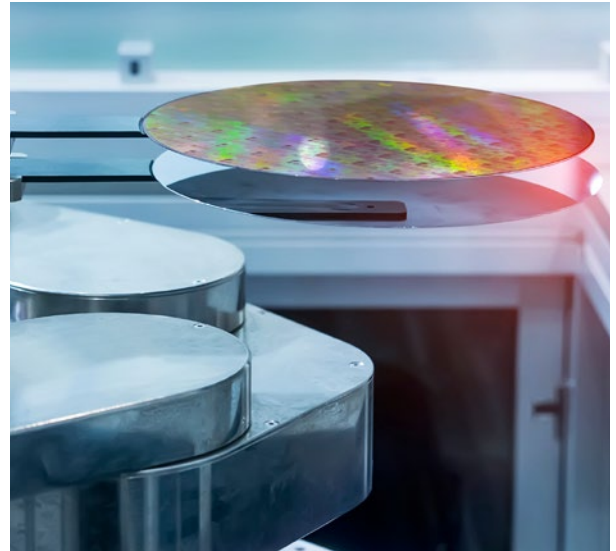
Triaxial sensor design with active sensor cable



- Triaxial sensor design: measurement electrode, guard ring electrode and grounding
- Guard ring electrode ensures a homogeneous measuring field for precise measurements with highest signal stability
- Particularly low noise: electrically shielded sensor cable
- Highly precise – even when multiple sensors are arranged very close together
- Sensors with short-circuit safety

✔ Unmatched precision

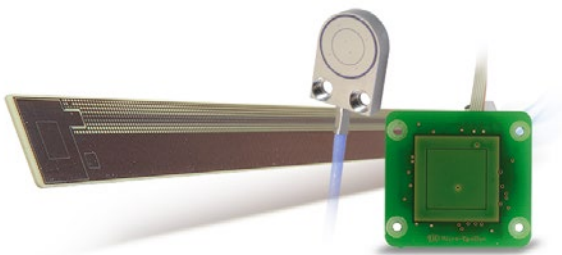
Nanometer precision with subnanometer resolution



- High resolution from 0.015 nanometers
- Ultra-precision: linearity up to 200 nanometers
- Extremely reproducible
- Excellent long-term stability of $\pm 0.004\%$ FSO per month

✔ Extensive range of applications

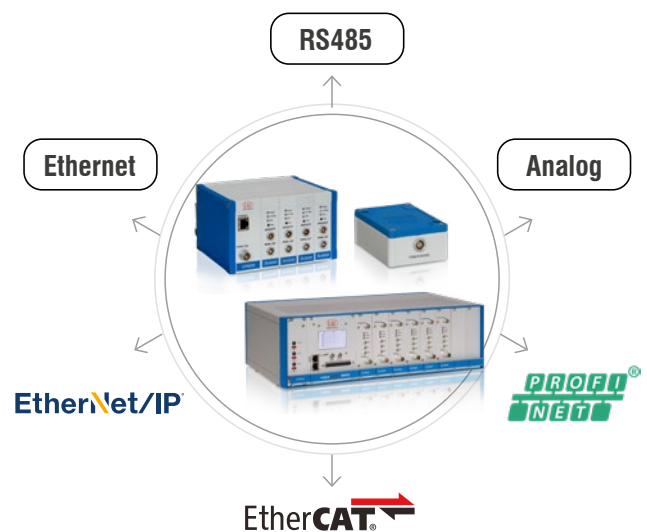
Widest portfolio of controllers and sensors



- All electrically conductive measuring objects: metals, alloys, CFRP, graphite, coatings
- No minimum thickness of the measuring object: an electrically conductive layer (e.g., $10\ \mu\text{m}$) is sufficient for measurement, e.g., vapor-deposited gold/metal layer
- Long distances possible: sensor cables up to 40 m
- Suitable for use on robots and in drag chains
- Various sensor models: flat/cylindrical/thread

✔ Easy integration into machines and straightforward retrofitting

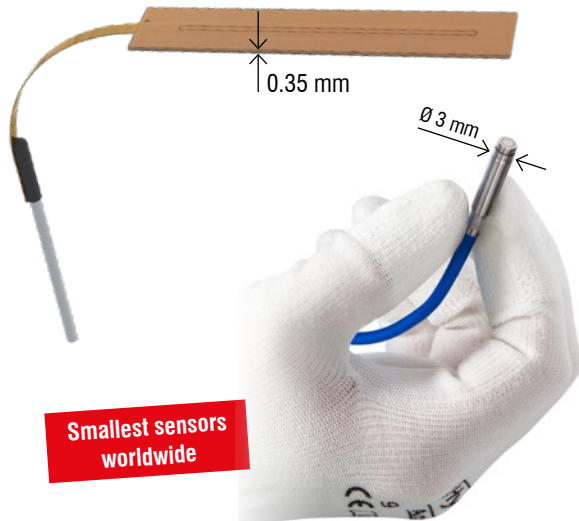
Numerous interfaces and easy integration



- Flexible integration due to industrial outputs: current, voltage, RS485, Ethernet and fieldbuses
- Secure mounting of the sensor and cable
- Simple installation concept requiring no special expertise
- Easy-to-clean sensor surfaces (CSF models)

✔ Miniature sensor sizes

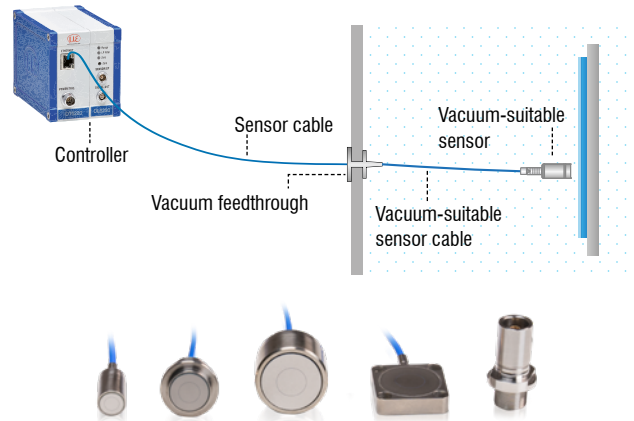
Takes up very little space at the measuring point



- No offset, measuring range starts directly at the sensor
- Integration in confined installation spaces with minimum effort
- Smallest diameters available with cylindrical sensors
- Extremely flat sensors available

✔ Applications in cleanroom and UHV

Passive and highly particle-free sensors

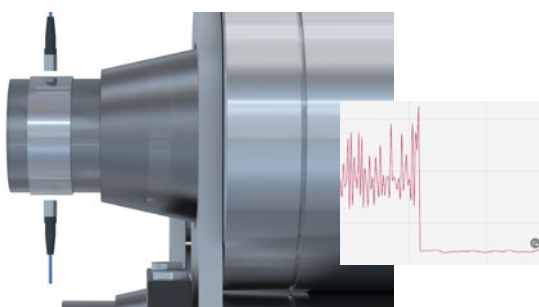


- No interactions between the sensor and the environment (e.g., force or heat transfer)
- Particle-free sensors and clean-room cables
- Special sensor design prevents virtual leaks
- Low-outgassing sensors (residual-gas analysis)
- Large selection of vacuum-compatible sensors, cables and feedthroughs

Get in touch with us so we can help you define the right components for your vacuum class.

✔ Measurement on moving parts

Virtual grounding of the measuring object



Capacitive multi-channel controllers with channel synchronization

- Stable and noise-free measurement results even on moving objects
- Enables electron dissipation, resulting in a smooth measurement signal

Resolution in the micrometer range

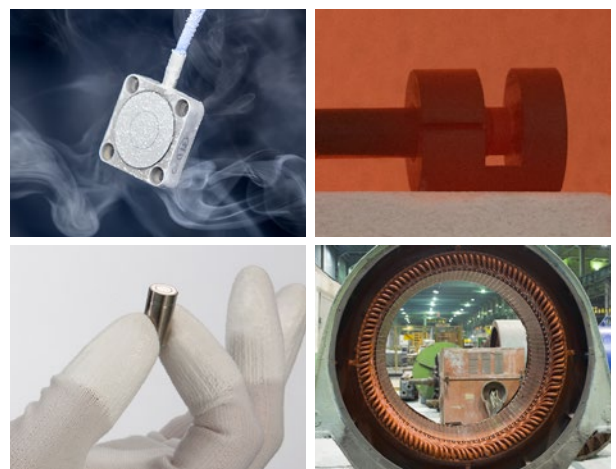
- Grounding of measuring object and controller recommended
- Or virtual grounding with multi-channel controllers

Resolution in the sub-micrometer range

- Grounding is absolutely necessary

✔ Built for durability in any environment

Highest signal stability in large temperature ranges



- Vacuum and cleanroom applications
- Excellent temperature stability of 5 ppm
- Use at very high and low temperatures from -270 to +800 °C
- Use in strong magnetic fields and high pressure

Flexible solutions from standard to OEM

capaNCDT

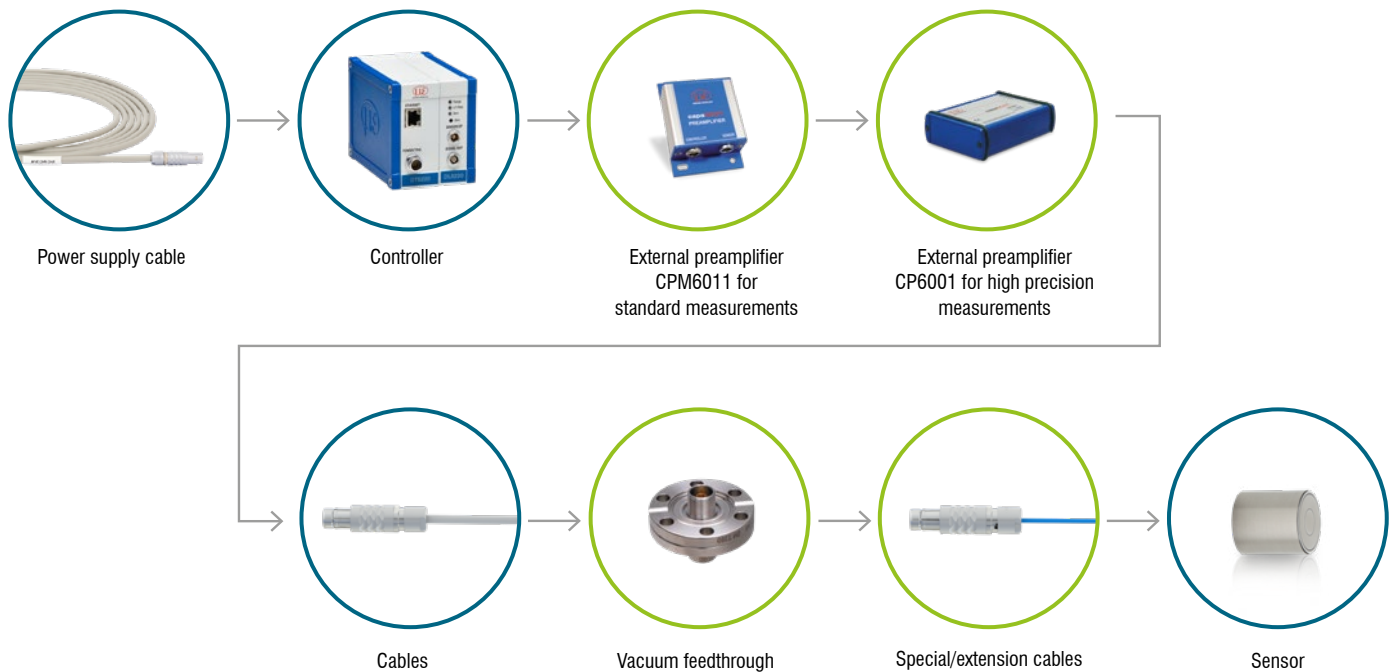
Design and characteristics of capacitive measuring systems

Capacitive measuring systems from Micro-Epsilon consist of at least three components:

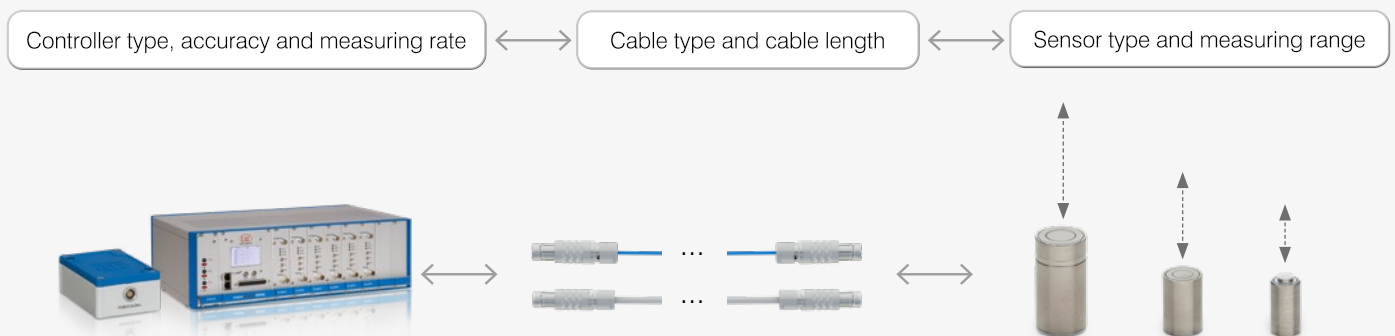
- Sensor with socket/sensor with integrated cable
- Sensor cable
- ▪ Controller (consisting of oscillator, microcontroller and demodulator)
- Connection cables

Depending on the measurement task, the following components are added:

- Preamplifier, e.g. for long cable routes
- Vacuum feedthrough
- ▪ Special/extension cables



The full compatibility of all system components enables numerous combinations:



Specific sensors for OEM

When standard solutions reach their limits, we tailor our sensors and controllers to your specific requirements.

Frequently asked modifications include:

- Adapted design
- Target-specific adaptation
- Mounting options
- Individual cable lengths
- Modified measuring ranges
- Sensors with pre-installed controller
- Output types and interfaces

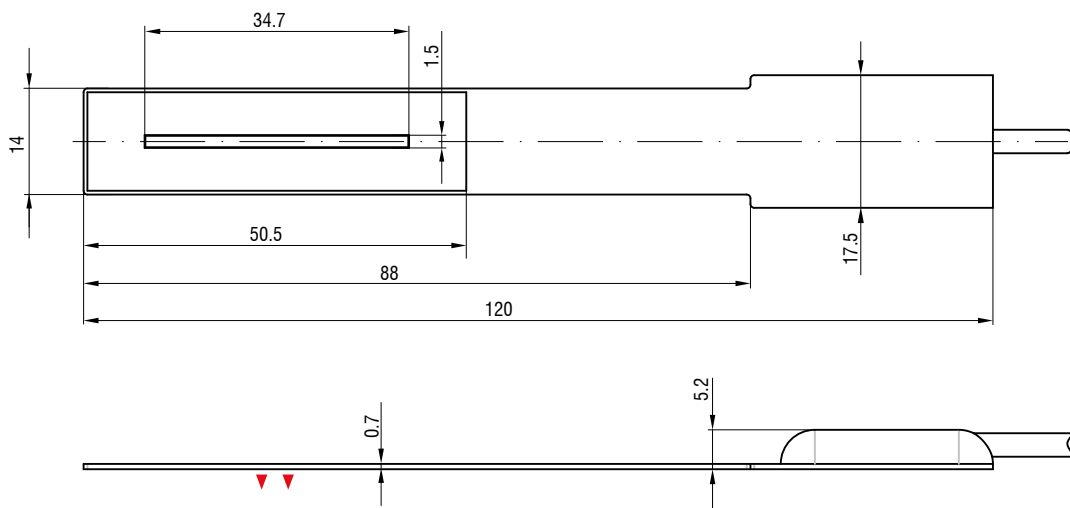


Dimensions

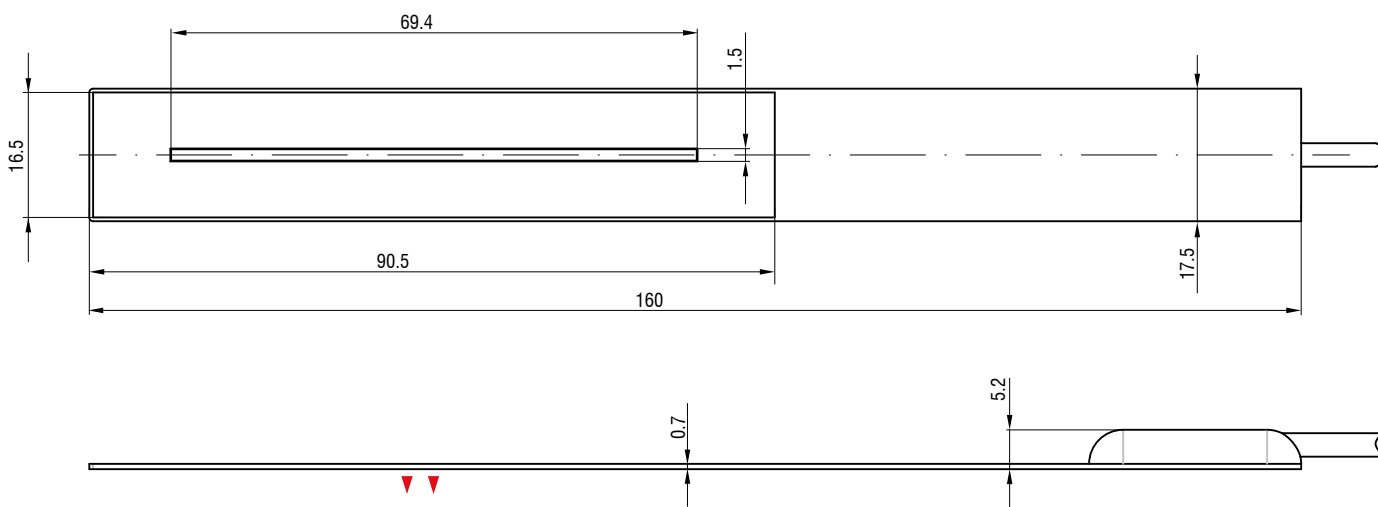
capa^{NC}DT CSF

Flat sensors with integrated sensor cable

CSF2-CRg4.0



CSF4-CRg4.0



CSF6-CRg4.0

