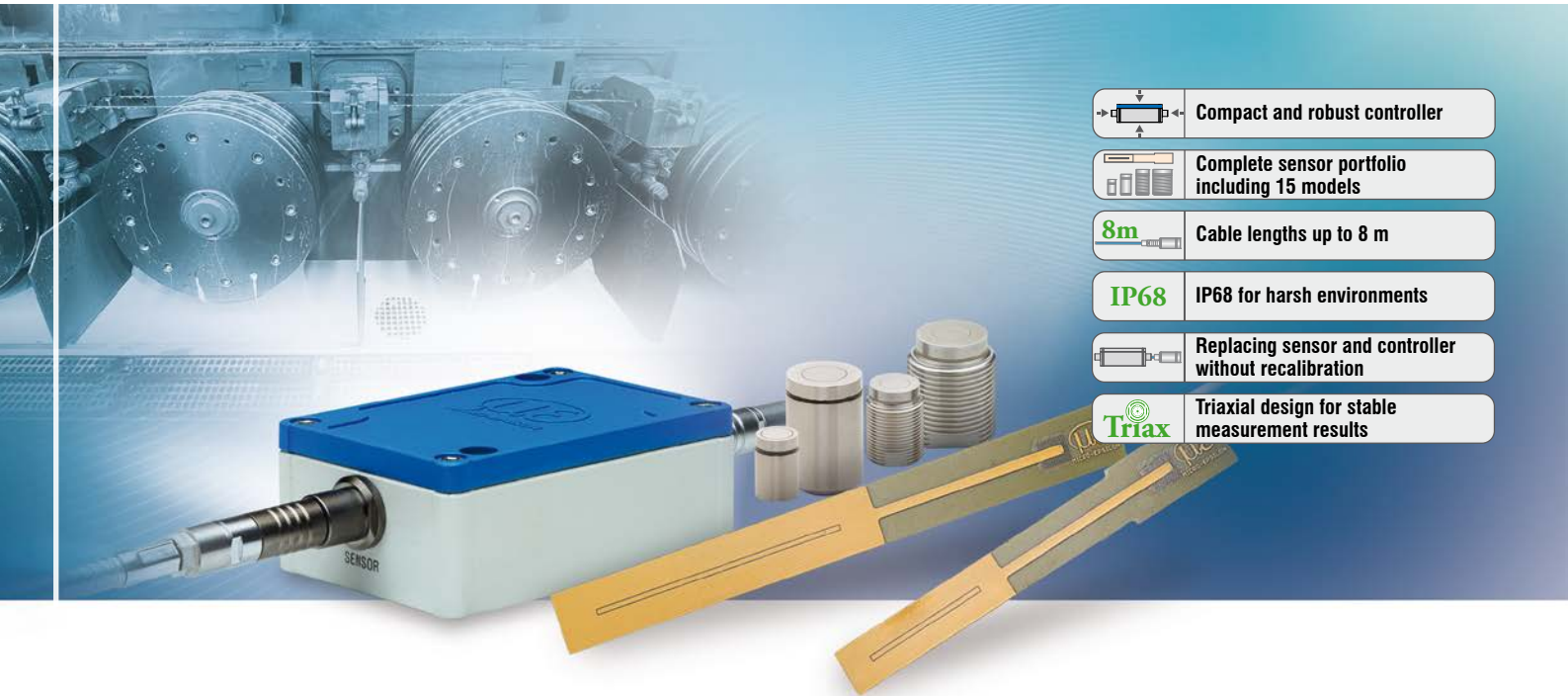










More Precision

capa**NCDT** 61x0/IP // Capacitive measuring system for industrial applications





-  **Compact and robust controller**
-  **Complete sensor portfolio including 15 models**
-  **8m** Cable lengths up to 8 m
-  **IP68** IP68 for harsh environments
-  **Replacing sensor and controller without recalibration**
-  **Triax** Triaxial design for stable measurement results

The capaNCDT 61x0/IP is an industrial-grade, capacitive measuring system for inline quality assurance and for plant and machinery control. This precise sensor system consists of a sensor, a sensor cable and a controller, which are ready for use without any on-site calibration. The sensor system detects parameters such as distance, deflection, expansion, displacement and deformation on conductive targets. Very good temperature stability, insensitivity to magnetic fields and a robust design make the capaNCDT 61x0/IP ideally suitable for measurement tasks in industrial environments.

Robust sensor cable

- Temperature resistant
- Tread-proof
- Lengths up to 8 m

Industrial controller

- Compact aluminum die-cast housing
- Dust-proof and watertight (IP68)
- Industrial outputs: current, voltage, RS485

Wide sensor range

- Robust & temperature resistant
- Exchangeable without recalibration
- Models: flat / cylinder / thread

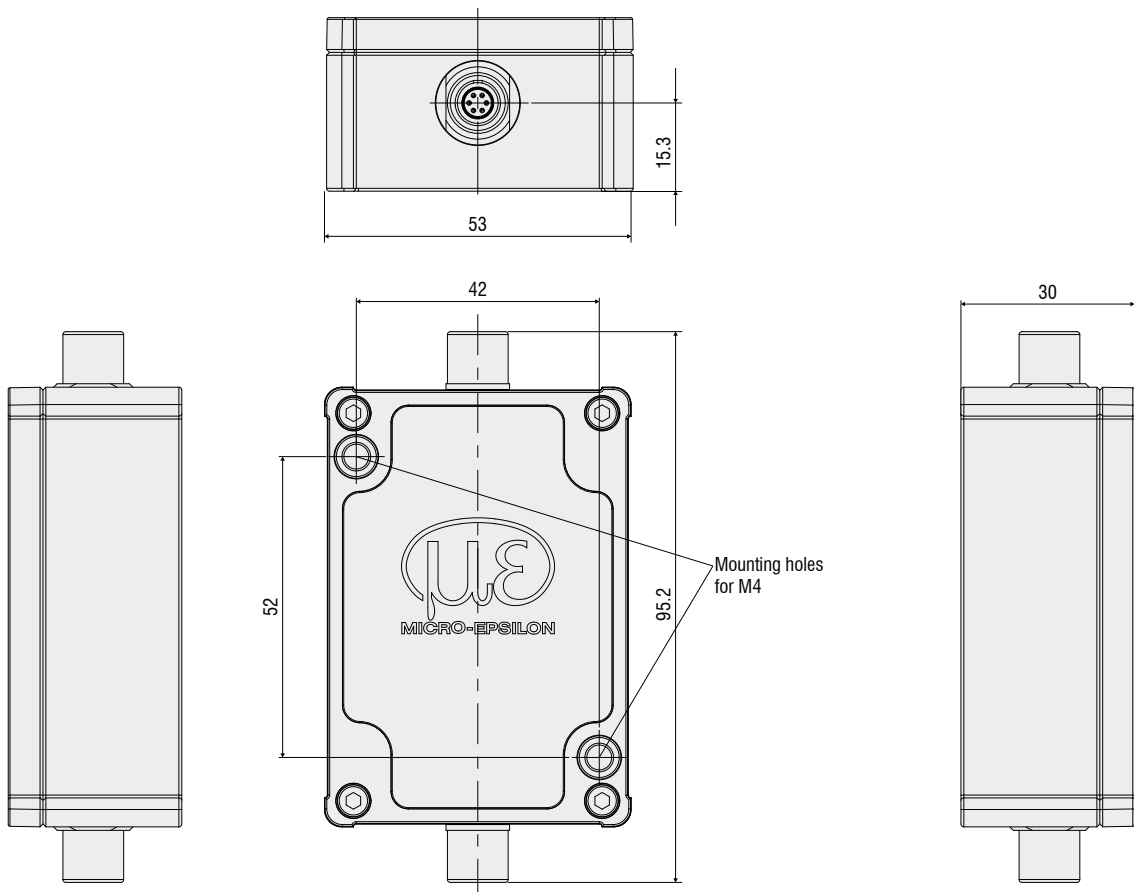


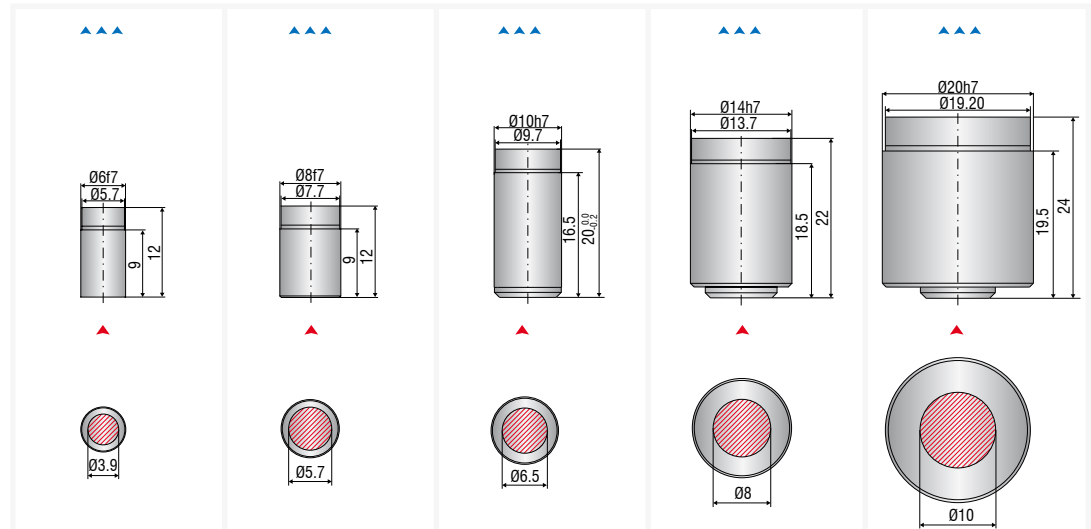
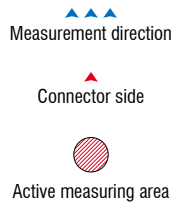
Modell	DT6110/IP/U	DT6120/IP/U	DT6110/IP/I	DT6120/IP/I
Resolution	static 2 Hz			0.01 % FSO
	dynamic 1 kHz			0.02 % FSO
Frequency response (-3 dB)				1 kHz
Linearity				$\leq \pm 0.1$ % FSO
Temperature stability ¹⁾				50 ppm FSO/K
Sensitivity				$\leq \pm 0.1$ % FSO
Long-term stability				0.02 % FSO/month
Synchronization	no			
Supply voltage	9 ... 28 VDC	9 ... 28 VDC	11 ... 28 VDC	11 ... 28 VDC
Power consumption	1.4 W	1.6 W	2 W	2.2 W
Analog output	0 ... 10 V / ± 5 V (short circuit proof)		4 ... 20 mA (max. 500 Ω load)	
Digital interface ²⁾	-	RS485	-	RS485
Connection	sensor connection: type B socket; IP68 supply & output connection: 6-pin socket; IP68			
Temperature range	Operation	-20 °C ... +60 °C		
	Storage	-20 °C ... +75 °C		
Shock (DIN-EN 60068-2-29)	20 g / half-sine 5 ms in XYZ axes / 1000 shocks per axis			
Vibration (DIN-EN 60068-2-6)	10 g / 10 ... 2000 Hz in XYZ axes / 10 cycles per axis			
Protection class (DIN-EN 60529)	IP68			
Material	die-cast aluminum			
Weight	165 g			

FSO = full scale output

¹⁾ valid with +10 °C to +40 °C, 100 ppm FSO/K with -20 °C ... +10 °C, or with +40 °C ... +60 °C

²⁾ baud rate 230,400 Bd (adjustable), max. 2 kSa/s (adjustable), 24 Bit measured values





Model		CSE05	CSE1	CSE1.25	CSE2	CSE3
Measuring range	reduced	0.25 mm	0.5 mm	0.625 mm	1 mm	1.5 mm
	nominal	0.5 mm	1 mm	1.25 mm	2 mm	3 mm
	extended	1 mm	2 mm	2.5 mm	4 mm	6 mm
Linearity ¹⁾		$\leq \pm 0,5 \mu\text{m}$	$\leq \pm 1 \mu\text{m}$	$\leq \pm 1,25 \mu\text{m}$	$\leq \pm 2 \mu\text{m}$	$\leq \pm 3 \mu\text{m}$
Resolution with DT61x0/IP	static 2 Hz	0.05 μm	0.1 μm	0.125 μm	0.2 μm	0.3 μm
	dynamic 1 kHz	0.1 μm	0.2 μm	0.250 μm	0.4 μm	0.6 μm
Temperature stability ²⁾		0.02 $\mu\text{m}/\text{K}$	0.02 $\mu\text{m}/\text{K}$	0.12 $\mu\text{m}/\text{K}$	0.15 $\mu\text{m}/\text{K}$	0.16 $\mu\text{m}/\text{K}$
Temperature range	Operation	-50 °C ... +200 °C	-50 °C ... +200 °C	-50 °C ... +200 °C	-50 °C ... +200 °C	-50 °C ... +200 °C
	Storage	-50 °C ... +200 °C	-50 °C ... +200 °C	-50 °C ... +200 °C	-50 °C ... +200 °C	-50 °C ... +200 °C
Humidity ³⁾		0 ... 95 % r.H.	0 ... 95 % r.H.	0 ... 95 % r.H.	0 ... 95 % r.H.	0 ... 95 % r.H.
Min. target size (flat)		Ø6 mm	Ø8 mm	Ø10 mm	Ø14 mm	Ø20 mm
Shock (DIN-EN 60068-2-29) ⁴⁾		30 g / 5 ms in XY axes / 1000 shocks per axis				
Vibration (DIN-EN 60068-2-6) ⁴⁾		20 g / 58 Hz ... 2000 Hz in XY axes / 10 cycles per axis				
Protection class (DIN-EN 60529)		IP40	IP40	IP40	IP40	IP40
Weight		2 g	3.5 g	8.2 g	20 g	50 g
Material		NiFe (magn.)	NiFe (magn.)	1.4404 (non-magn.)	1.4404 (non-magn.)	1.4404 (non-magn.)
Connection		type C socket	type C socket	type B socket	type B socket	type B socket
Mounting		clamping	clamping	clamping	clamping	clamping
Distance from the sensor surface for the recommended mounting option		3 mm	3 mm	3.5 mm	3.5 mm	4.5 mm

¹⁾ referred to nominal measuring range, optional linearity calibration (see page 10)

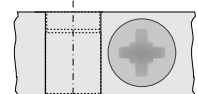
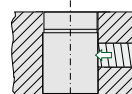
²⁾ with recommended mounting option

³⁾ non condensing

⁴⁾ with locked connector

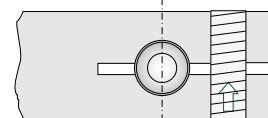
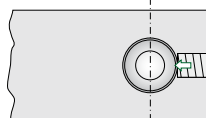
Use a grub screw (plastics)

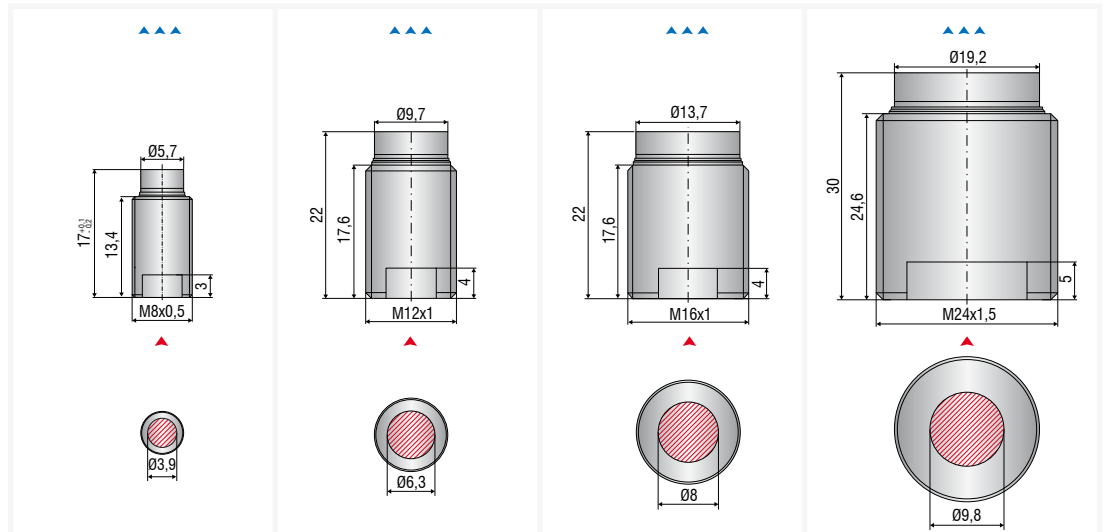
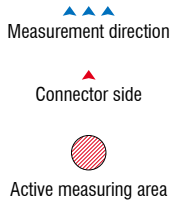
Use a clamping collet



Installing cylindrical sensors

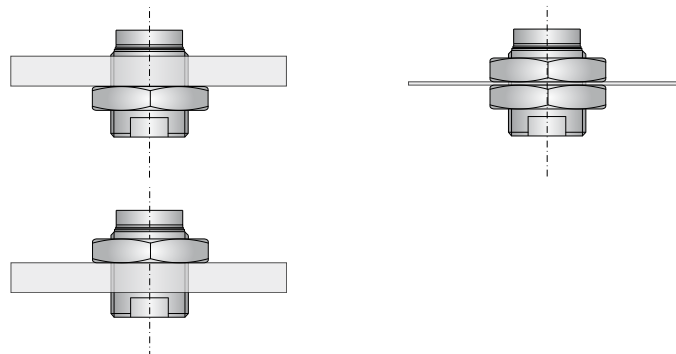
All sensors can be installed as both freestanding and flush units. The sensors can be clamped or fastened using a collet.





Model		CSE05/M8	CSE1.25/M12	CSE2/M16	CSE3/M24
Measuring range	reduced	0.25 mm	0.625 mm	1 mm	1.5 mm
	nominal	0.5 mm	1.25 mm	2 mm	3 mm
	extended	1 mm	2.5 mm	4 mm	6 mm
Linearity ¹⁾		≤ ± 0,5 μm	≤ ± 1,25 μm	≤ ± 2 μm	≤ ± 3 μm
Resolution with DT61x0/IP	static 2 Hz	0.05 μm	0.125 μm	0.2 μm	0.3 μm
	dynamic 1 kHz	0.1 μm	0.250 μm	0.4 μm	0.6 μm
Temperature stability ²⁾		0.02 μm/K	0.12 μm/K	0.15 μm/K	0.16 μm/K
Temperature range	Operation	-50 °C ... +200 °C	-50 °C ... +200 °C	-50 °C ... +200 °C	-50 °C ... +200 °C
	Storage	-50 °C ... +200 °C	-50 °C ... +200 °C	-50 °C ... +200 °C	-50 °C ... +200 °C
Humidity ³⁾		0 ... 95 % r.H.	0 ... 95 % r.H.	0 ... 95 % r.H.	0 ... 95 % r.H.
Min. target size (flat)		Ø6 mm	Ø10 mm	Ø14 mm	Ø20 mm
Shock (DIN-EN 60068-2-29) ⁴⁾		30 g / 5 ms in XY axes / 1000 shocks per axis			
Vibration (DIN-EN 60068-2-6) ⁴⁾		20 g / 58 Hz ... 2000 Hz in XY axes / 10 cycles per axis			
Protection class (DIN-EN 60529)		IP40	IP40	IP40	IP40
Weight		3.5 g	11.5 g	35 g	80 g
Material		NiFe (magn.)	1.4404 (non-magn.)	1.4404 (non-magn.)	1.4404 (non-magn.)
Connection		type C	type B	type B	type B
Mounting		thread M8x0.5	thread M12x1	thread M16x1	thread M24x1.5
Distance from the sensor surface for the recommended mounting option		3.6 mm	4.4 mm	4.4 mm	5.4 mm

¹⁾ referred to nominal measuring range, optional linearity calibration (see page 10)
²⁾ with recommended mounting option
³⁾ non condensing
⁴⁾ with locked connector



Installing thread sensors

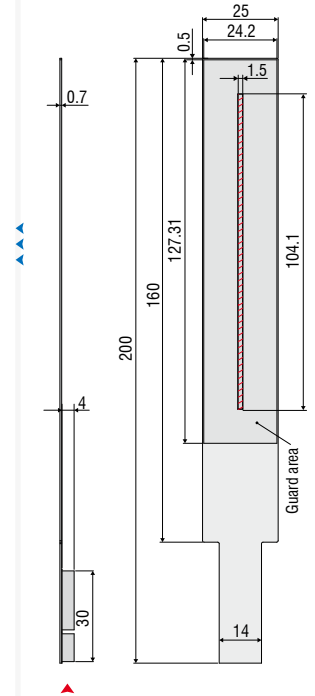
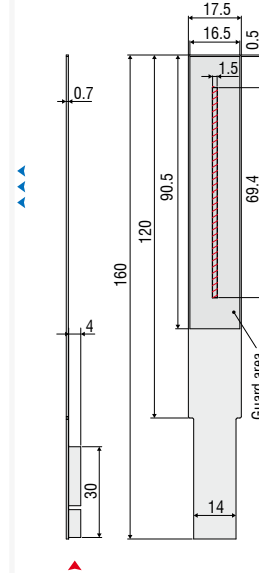
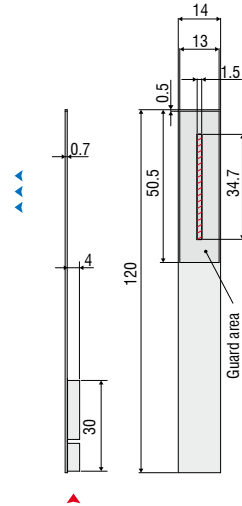
Please refer to the operating instructions for the tightening torque.

▲▲▲
Measurement direction



Active measuring area

▲
Connector side



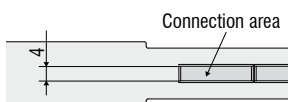
Model		CSF2	CSF4	CSF6
Measuring range	reduced	1 mm	2 mm	3 mm
	nominal	2 mm	4 mm	6 mm
	extended	4 mm	8 mm	12 mm
Linearity ¹⁾		4 μm	8 μm	12 μm
Resolution with DT61x0/IP	static 2 Hz	0.66 μm	1.37 μm	1.84 μm
	dynamic 1 kHz	0.9 μm	1.8 μm	2.8 μm
Temperature stability ²⁾		0.2 $\mu\text{m}/\text{K}$	0.4 $\mu\text{m}/\text{K}$	0.6 $\mu\text{m}/\text{K}$
Temperature range	Operation	-40 °C ... +100 °C	-40 °C ... +100 °C	-40 °C ... +100 °C
	Storage	-40 °C ... +100 °C	-40 °C ... +100 °C	-40 °C ... +100 °C
Humidity ³⁾		0 ... 95 % r.H.	0 ... 95 % r.H.	0 ... 95 % r.H.
Required gap width		≥ 0.75 mm	≥ 0.75 mm	≥ 0.75 mm
Min. target size (flat)		approx. 50.5 x 14 mm	approx. 90.5 x 17.5 mm	approx. 127.31 x 25 mm
Shock (DIN-EN 60068-2-29) ⁴⁾			30 g / 5 ms in XY axes / 1000 shocks per axis	
Vibration (DIN-EN 60068-2-6) ⁴⁾			20 g / 58 Hz ... 2000 Hz in XY axes / 10 cycles per axis	
Protection class (DIN-EN 60529)		IP40	IP40	IP40
Weight		5 g	7 g	10 g
Material		hard tissue (GFRP)	hard tissue (GFRP)	hard tissue (GFRP)
Connection		type E socket	type E socket	type E socket

¹⁾ referred to nominal measuring range, optional linearity calibration (see page 10)

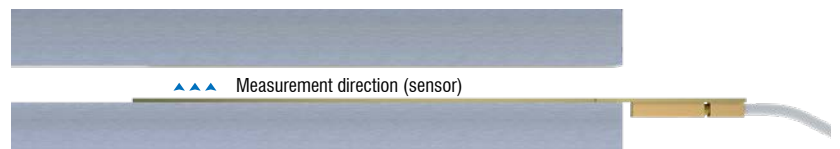
²⁾ valid when system is not installed

³⁾ non condensing

⁴⁾ with locked connector



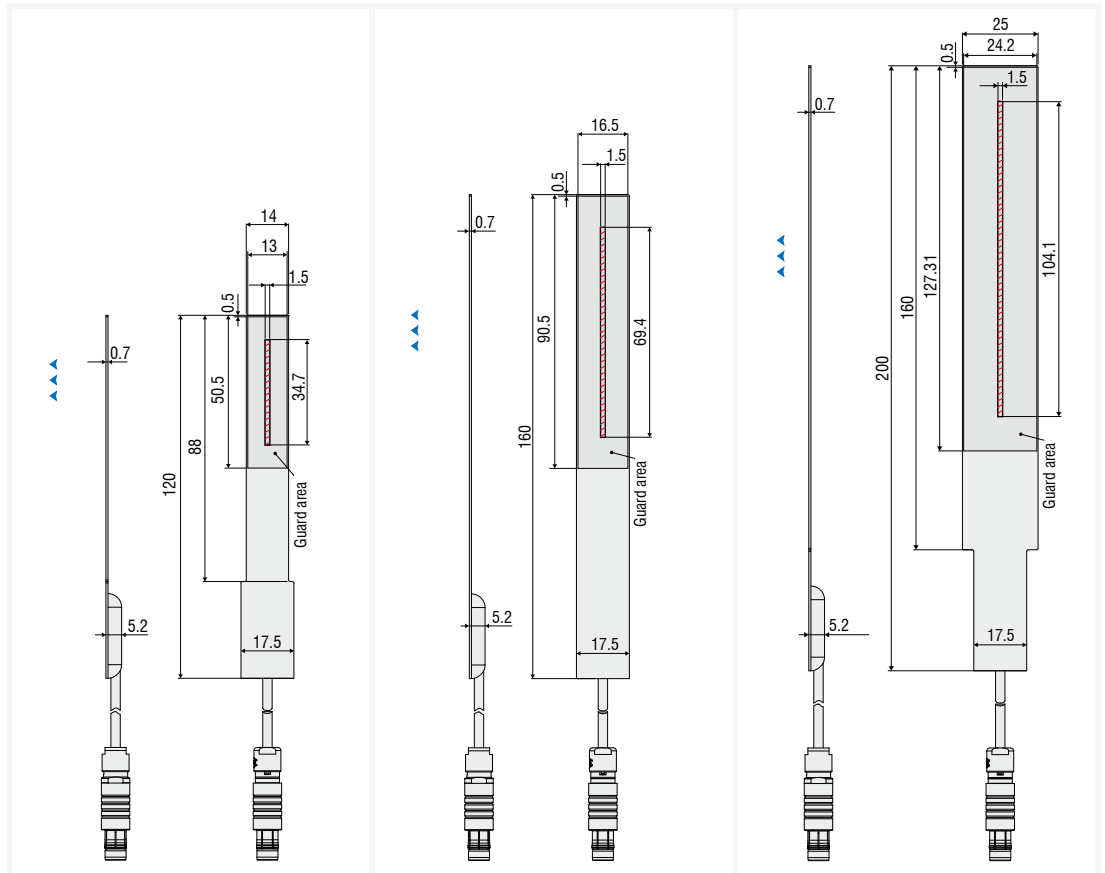
Plug for sensor cable type E



▲▲▲
Measurement direction

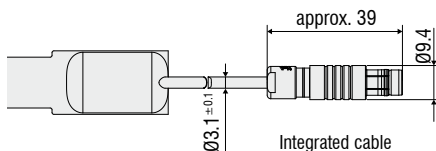


Active measuring area

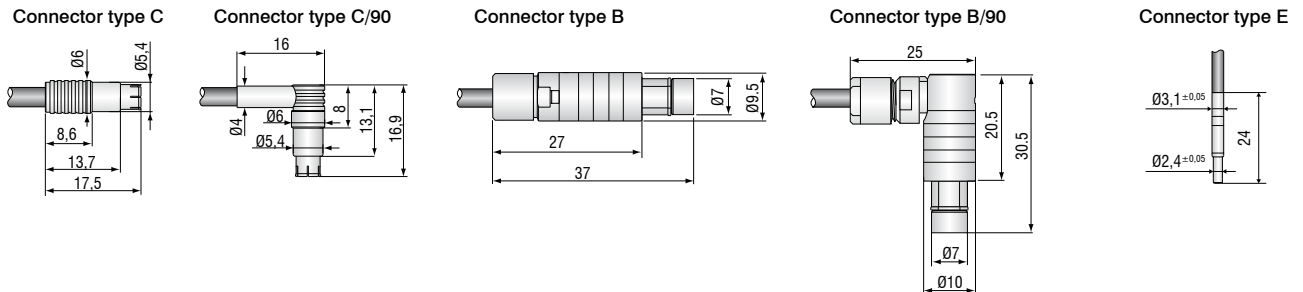


Model		CSF2-CRg4.0	CSF4-CRg4.0	CSF6-CRg4.0
Measuring range	reduced	1 mm	2 mm	3 mm
	nominal	2 mm	4 mm	6 mm
	extended	4 mm	8 mm	12 mm
Linearity ¹⁾		4 μm	8 μm	12 μm
Resolution with DT61x0/IP	static 2 Hz	0.66 μm	1.37 μm	1.84 μm
	dynamic 1 kHz	0.9 μm	1.8 μm	2.8 μm
Temperature stability ²⁾		0.2 $\mu\text{m}/\text{K}$	0.4 $\mu\text{m}/\text{K}$	0.6 $\mu\text{m}/\text{K}$
Temperature range	Operation	-40 °C ... +100 °C	-40 °C ... +100 °C	-40 °C ... +100 °C
	Storage	-40 °C ... +100 °C	-40 °C ... +100 °C	-40 °C ... +100 °C
Humidity ³⁾		0 ... 95 % r.H.	0 ... 95 % r.H.	0 ... 95 % r.H.
Required gap width		≥ 0.75 mm	≥ 0.75 mm	≥ 0.75 mm
Min. target size (flat)		approx. 50.5 x 14 mm	approx. 90.5 x 17.5 mm	approx. 127.31 x 25 mm
Shock (DIN-EN 60068-2-29) ⁴⁾		30 g / 5 ms in XY axes / 1000 shocks per axis		
Vibration (DIN-EN 60068-2-6) ⁴⁾		20 g / 58 Hz ... 2000 Hz in XY axes / 10 cycles per axis		
Protection class (DIN-EN 60529)		IP40	IP40	IP40
Weight		75 g	77 g	80 g
Material		hard tissue (GFRP)	hard tissue (GFRP)	hard tissue (GFRP)
Connection		integrated sensor cable, 4 m	integrated sensor cable, 4 m	integrated sensor cable, 4 m

¹⁾ referred to nominal measuring range, optional linearity calibration (see page 10)
²⁾ valid when system is not installed
³⁾ non condensing
⁴⁾ with locked connector



Connector types



Supply and signal cables

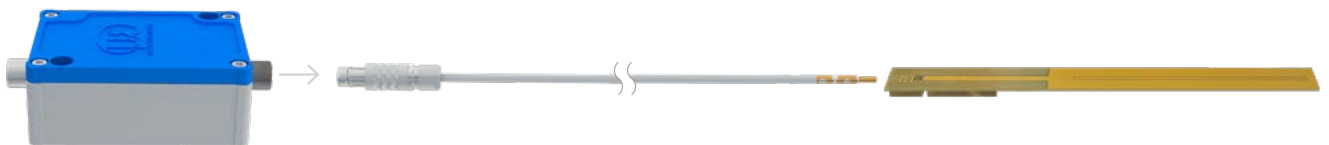
SCAC3/6/IP Signal cable analog/digital with IP68 plug and anti-kink sleeve
SCAC3/6 Signal cable analog/digital

- Open ends or type B plug (controller)
- 3 m long
- Temperature resistance $-40\text{ °C} \dots +90\text{ °C}$ (in motion); $-50\text{ °C} \dots 90\text{ °C}$ (motionless)
- Outer diameter: $4.85\text{ mm} \pm 0.15\text{ mm}$
- Minimum bending radius $>37.5\text{ mm}$



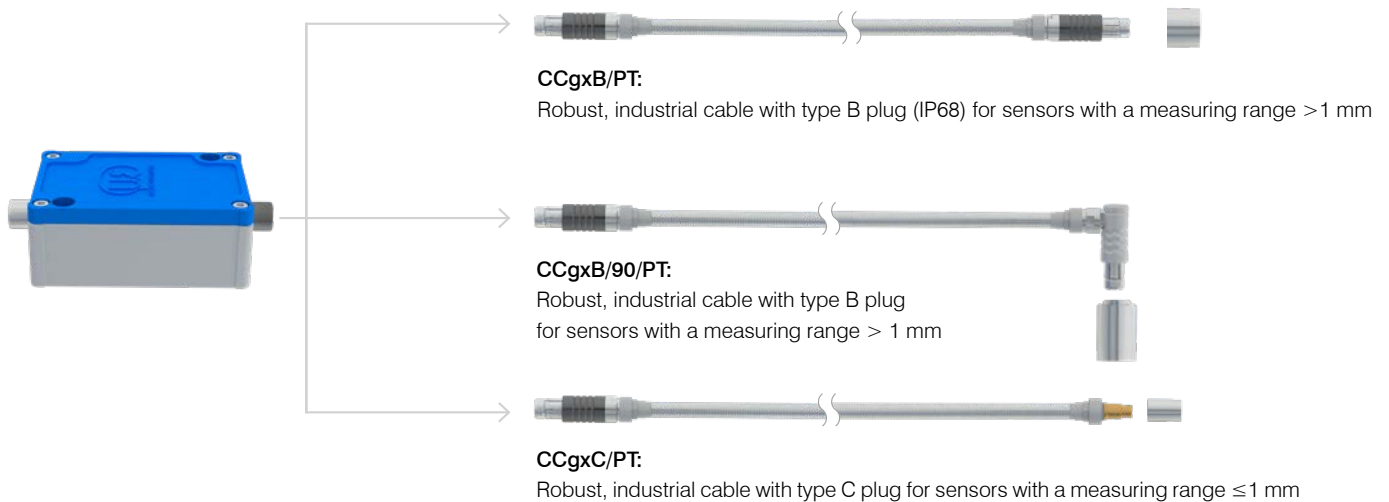
CCgx/E sensor cable for flat sensors

- 4 m long, with patented miniature plug
- Type B plug (controller), type E plug (sensor)
- Temperature resistance: $-20\text{ °C} \dots +80\text{ °C}$ (permanent); $-20\text{ °C} \dots +100\text{ °C}$ (10,000 h)
- Outer diameter: $3.1\text{ mm} \pm 0.1\text{ mm}$
- Minimum bending radius static $>10\text{ mm}$; dynamic $>22\text{ mm}$ (30 mm recommended)



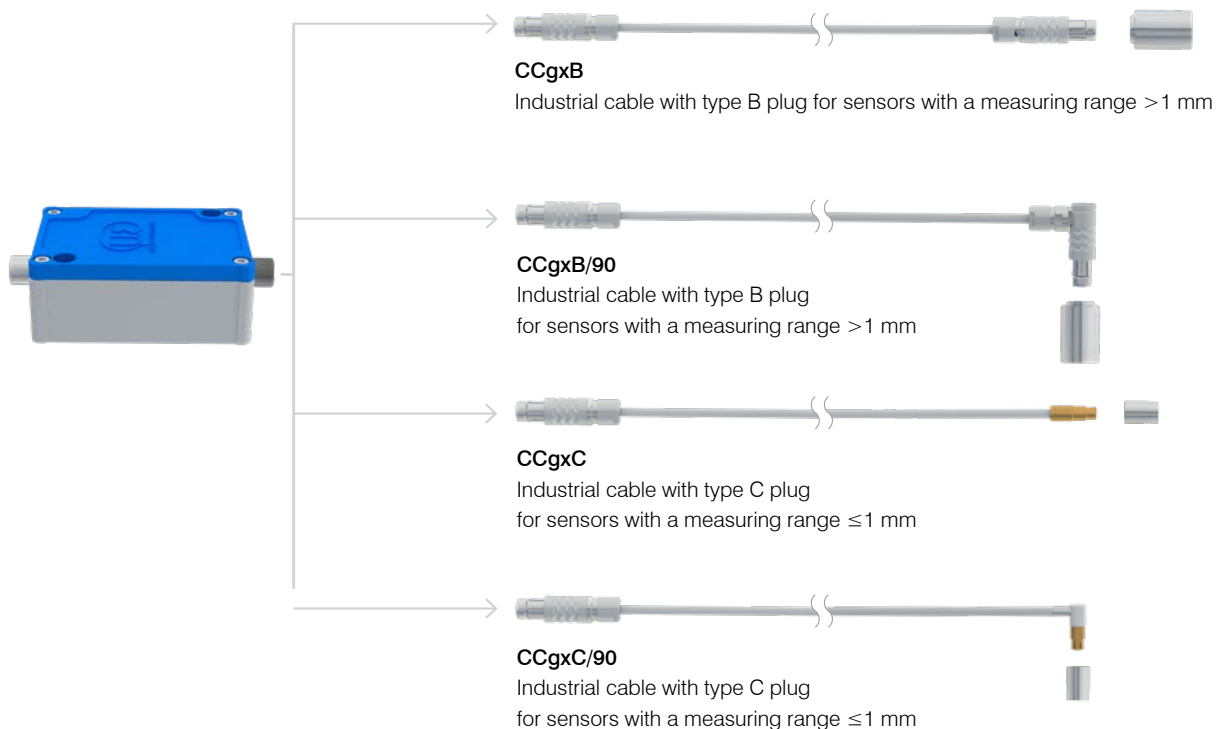
CCgx/PT Tread-proof sensor cable with protective metal tubing

- Type B plug controller side, (IP68)
- Available with 1 m, 2 m, 4 m, 6 m and 8 m
- Temperature resistance -20 °C ... +80 °C (permanent); -20 °C ... +100 °C (10,000 h)
- Outer diameter: 6 mm ± 0.15 mm
- Minimum bending radius static >20 mm; dynamic 30 mm



CCgx sensor cables for industrial applications

- Type B plug (controller)
- Available with 1 m, 2 m, 4 m, 6 m and 8 m
- Temperature resistance -20 °C ... +80 °C (permanent); -20 °C ... +100 °C (10,000 h)
- Outer diameter: 3.1 mm ± 0.1 mm
- Minimum bending radius static >10 mm; dynamic >22 mm (30 mm recommended)



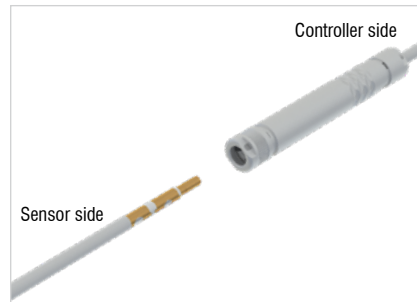
Special solutions for the industry on request

Application examples are often found where the standard versions of the sensors and the controller are performing at their limits.

For these special tasks, we modify the sensors according to your individual requirements. Changes requested include, for example, modified designs, target calibration, mounting options, individual cable lengths, modified measuring ranges or sensors with integrated controller.



Bendable extended sensor board for restricted installation space



Triaxial connector for cable extension with miniature type E plug



90° plug for special installation scenarios

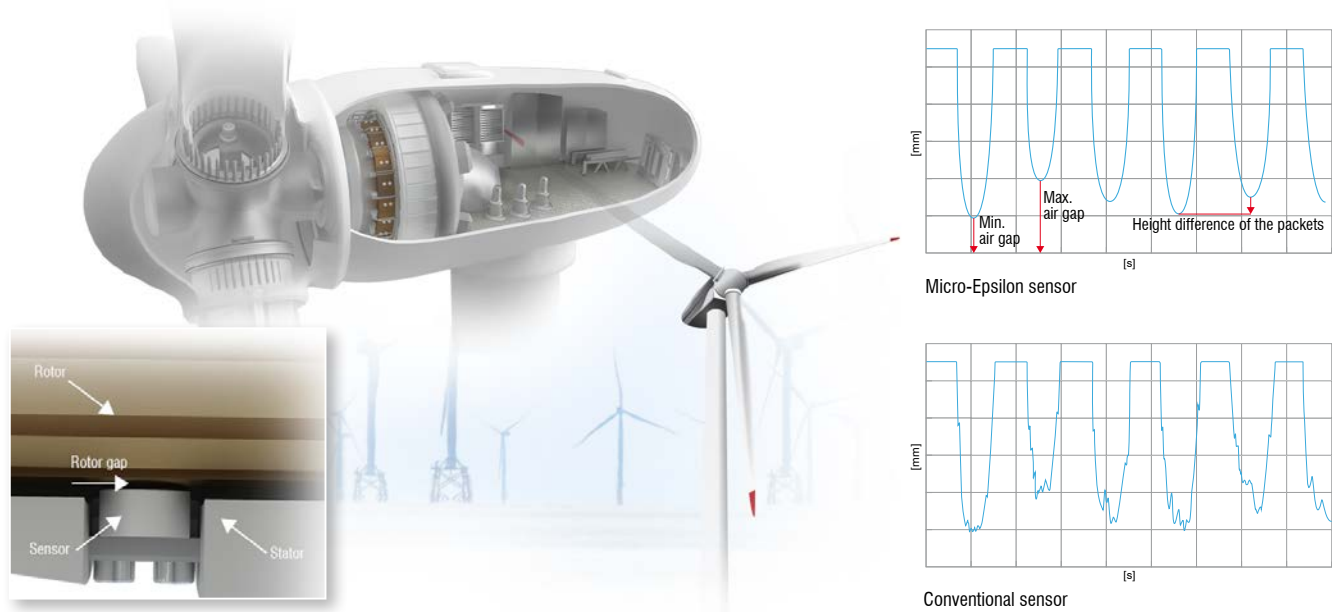
Optional linearity calibration for improved linearity

With linearity calibration, the controller is calibrated with the sensor cable and the sensor. This improves the linearity values by a factor of approx. 10. When replacing a sensor, the controller must be adjusted again in order to maintain improved linearity.

Example:

The linearity of a system consisting of a DT6120/IP/I controller, a CCg6B/PT sensor cable and a CSE2 sensor is 0.3 % FSO ($6 \mu\text{m}$). After linear calibration, the linearity increases to 0.02 % FSO ($0.4 \mu\text{m}$).

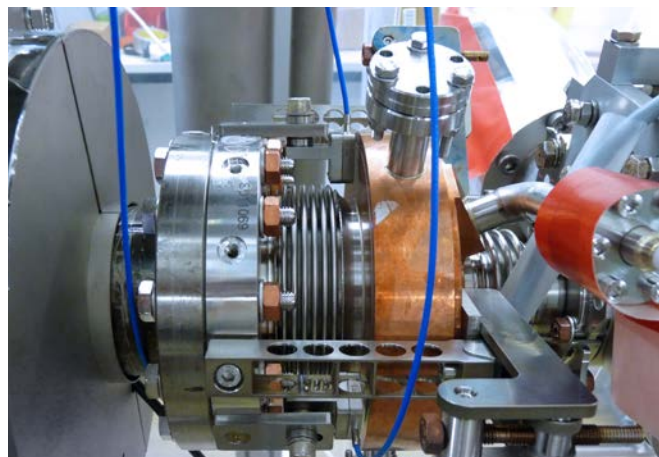
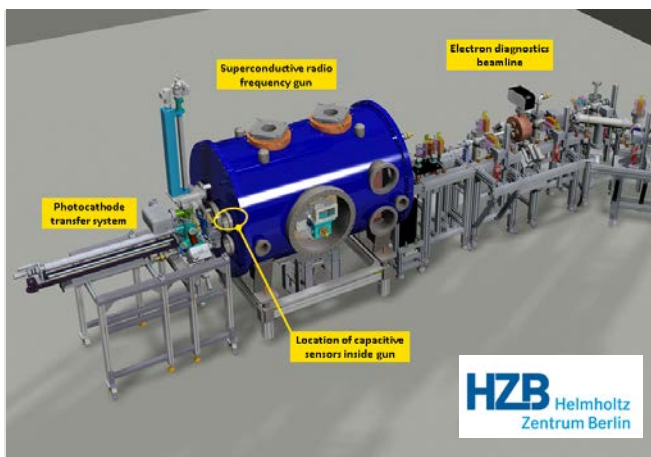
Gap measurements



Thickness measurement of brake discs



Precise alignment of the cathodes at the electron accelerator



High performance sensors made by Micro-Epsilon



Sensors and systems for displacement and position



Sensors and measurement devices for non-contact temperature measurement



2D/3D profile sensors (laser scanner)



Optical micrometers, fiber optic sensors and fiber optics



Color recognition sensors, LED analyzers and color inline spectrometer



Measurement and inspection systems