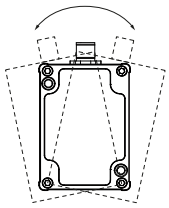
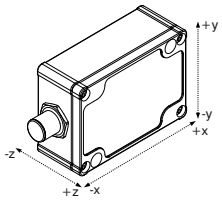
MICRO-EPSILON

More Precision

inertialSENSOR // Inclination and acceleration sensors

- *Highest accuracy and resolution for precise measurements*
- *Extremely stable measurement signal with strongly fluctuating temperatures*
- *Customer-specific designs*





Precise inclination measurement

Precise inclination measurement is a demanding measurement task. Excellent angular accuracy and resolution make the inclination sensors ideally suitable for precise measurements in laboratory and industry.

Precise acceleration and oscillation measurements

Acceleration measurements are required where technical systems are exposed to stresses either caused by their own movement or by external impacts. Ideally suited to monitoring tasks or predictive system maintenance, the sensor reliably and precisely monitors the acceleration values of sensitive plant components.

All products at a glance

Applications

Temperature-stable oscillation measurement in wind turbines

Highly sensitive monitoring of floor vibrations and precise alignment of machine components

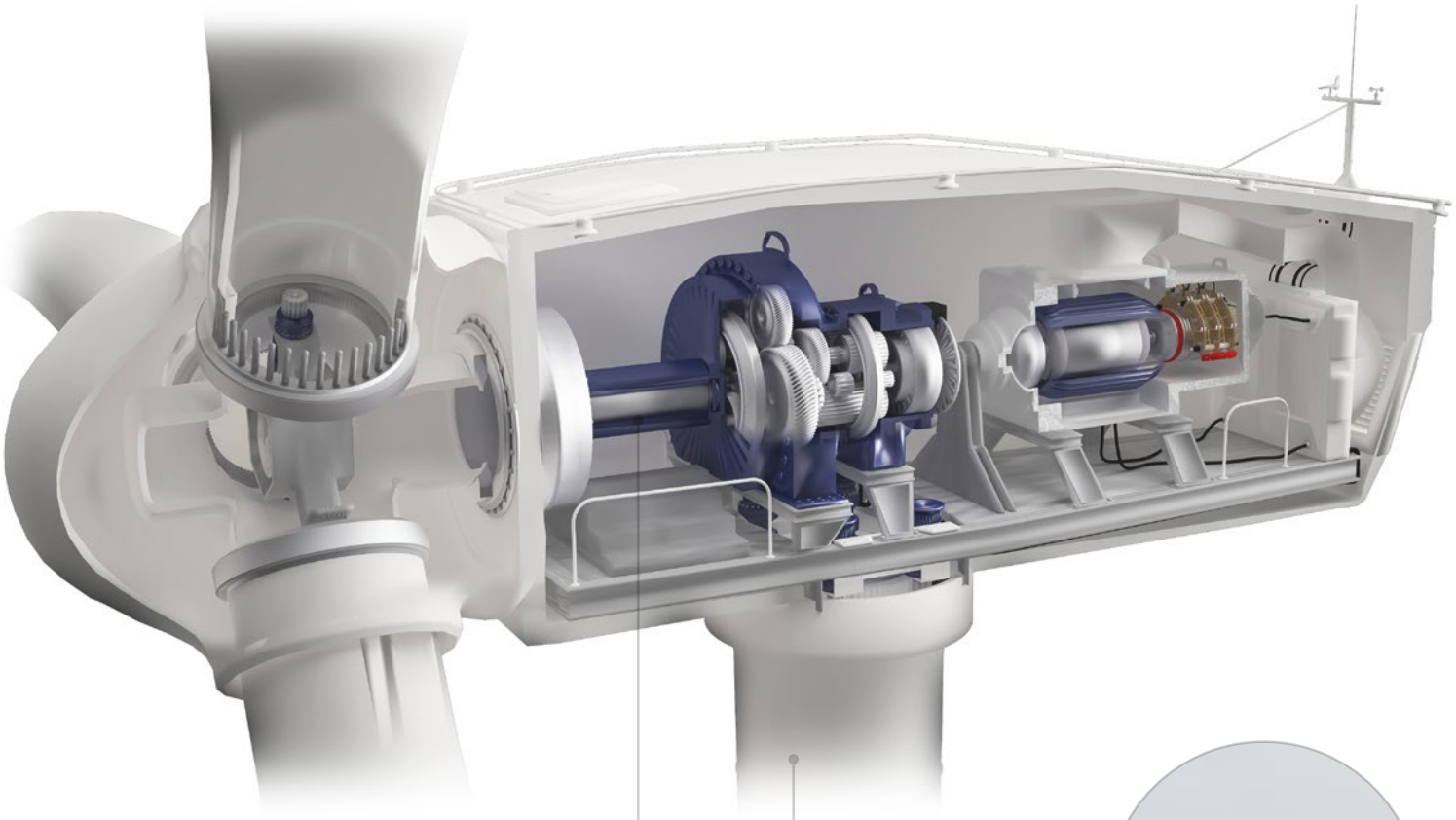
Condition monitoring of bearings

Inclination detection of telescopic arms and undercarriages

Reduced danger of tipping with loading wagons

Stone chipping with harvesters

Oscillation measurement in wind turbines



Oscillation measurement of the drive train
Wind turbulences cause dynamic stresses which influence the drive train structure and its inside. To measure these oscillations, high-precision and temperature-stable acceleration sensors from Micro-Epsilon are used.

Monitoring the tower oscillation
Wind turbines are exposed to high stresses caused by oscillations. In order to avoid damage and downtimes, these tower oscillations are monitored. Inclination and acceleration sensors from Micro-Epsilon detect the tower oscillation with highest precision even with strongly fluctuating temperatures.

- *Highest accuracy and resolution for precise measurements*
- *Extremely stable measurement signal with strongly fluctuating temperatures*
- *High EMC resistance (robust aluminum die-cast housing)*

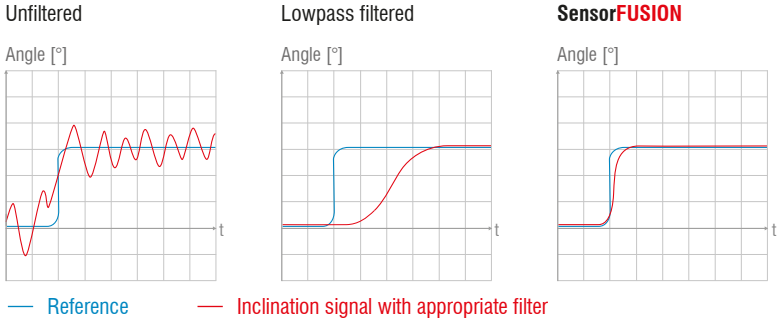
Ideal for high-precision inclination measurement

The INC5701 is a uniaxial inclination sensor that offers a measuring range up to 360°. The sensor stands out due to excellent angular accuracy and resolution intended for very accurate and precise measurements. The industrial-grade aluminum die-cast housing enables applications in extremely harsh ambient conditions such as, e.g., in close proximity to electromagnetic fields. In addition, high temperature stability ensures reliable measurements in environments with strongly fluctuating temperatures which makes the sensor ideally suitable for outdoor applications.

The INC5701 is available in two designs, with pure low-pass filter or with additional sensor data fusion and the Kalman filter for correct measurements with dynamic processes.

Fields of application

Excellent angular accuracy and resolution make the inclination sensors ideally suitable for precise measurements in laboratory and industry. In production monitoring, for example, machine components are precisely aligned using the INC5701.



SensorFUSION with Kalman filter

The Sensorfusion with the Kalman filter overcomes the significant delay of usual low-pass filters while simultaneously suppressing mechanical disturbances. This functionality is achieved by combining the output signal of the accelerometer with the signal of an angular rate sensor. The output signal is directly and immediately provided following the sensor's change in orientation.

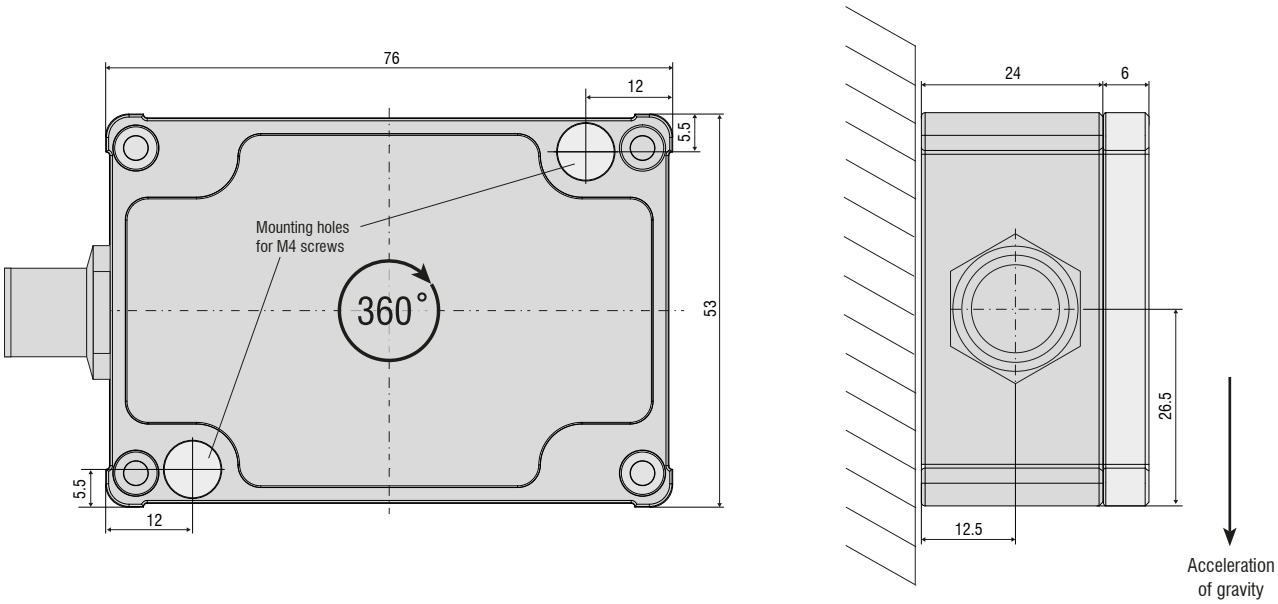
Article designation

INC570	1	S	-360	-SA	-RS485IU

- -RS485IU: Output: RS485IU = RS485, 4 ... 20 mA and 0.5 ... 4.5 V
- -SA: Connection: SA = Connector axial
- -360: Measuring range in °
- S: Model: S = Standard, D = Dynamic (SensorFUSION)
- 1: Number of axes
- INC570: High-precision inclination sensor

Model		INC5701S	INC5701D
Number of axes		1	
Adjustable filters		low-pass (0.3 … 30 Hz)	low-pass (0.3 … 30 Hz), SensorFUSION
Measuring range		1° … 360° (configurable) [1]	
Resolution	digital	0.0002°	
	analog	Current: 0.0069°, voltage: 0.0083°	
Accuracy [2]	digital	≤ ± 0.04°	
	analog	≤ ± 0.12°	
Sensitivity (analog output)		≤ 16 mA/° or ≤ 4 V/° [1]	
Sampling frequency		250 Hz	
Temperature stability	digital	0.0013°/ K	
	analog	0.0083°/ K	
Supply voltage		5 … 32 VDC	
Power consumption		< 1 W	
Temperature range	Operation	-40 … +85 °C	
	Storage	-40 … +85 °C	
Digital interface		RS485, Ethernet, PROFINET [3]	
Analog output		4 … 20 mA (max. 390 Ω) and 0.5 … 4.5 V (min. 1 kΩ) (configurable)	
Switching output		0 / 5 V (min. 1 kΩ)	
Protection class		IP 67 (connected)	
Max. angular velocity		-	± 300° / s
Shock		DIN EN 60068-2-27 (1500 g, 0.5 ms, half-sine shock, 3x in each direction)	
Weight		250 g	
Material		Aluminum die-cast	
Installation		Screw connection via mounting holes (M4)	
Connection		8-pin M12 connector	

All specifications are typical for +25 °C, unless otherwise stated.
[1] In order to achieve maximum sensitivity, continuous adjustment of the measuring range is possible.
(Examples: measuring range 1° → sensitivity 16 mA/° or 4 V/°; measuring range 360° → sensitivity 0.044 mA/° or 0.011 V/°)
[2] Accuracy based on full measuring range of 360° without inclination of sensor
[3] In combination with the Micro-Epsilon interface modules IF1032 (Ethernet) and IF2030 (PROFINET)



- *Customer-specific designs*
- *Space-saving and robust plastic housing*
- *Easy connection with AMP plug*
- *High shock resistance*

Ideal for serial integration

The MEMS-based ACC530x acceleration sensor is suitable for static and dynamic acceleration measurements. The sensor detects accelerations either in one or two axes.

Combined with compact design, its excellent price/performance ratio enables versatile fields of application in particular with serial applications involving large quantities.

Fields of application

The sensor is used to detect reliably critical accelerations and vibrations. High shock resistance and high protection class as well as simple and easy installation with an AMP plug make the ACC530x ideally suitable for serial applications, e.g., in mobile machines.

Article designation

ACC530	1	-2	-SR	-I

-I: Output: I = current 4 ... 20 mA; U = voltage 0.5 ... 4.5V

-SR: Connection: SR = radial plug

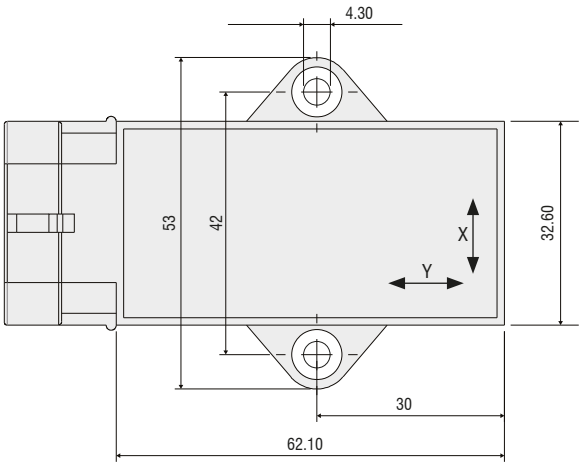
-2: Measuring range in ± g

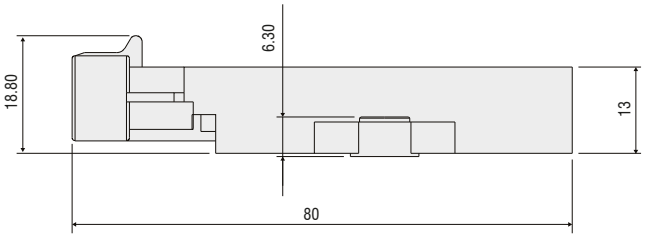
1: Number of axes

ACC530: Acceleration sensor for serial integration & OEM

Model		ACC5301-2	ACC5302-2
Number of axes		1	2
Measuring range		± 2 g [1]	
Noise		100 µg/√Hz	
Sensitivity (analog output)		4 mA/g or 1 V/g	
Zero		12 mA or 2.5 V	
Linearity		≤ ± 1.25 % FSO	
Frequency range		0 ... 100 Hz (-3dB) [1]	
Cross axis sensitivity		≤ ± 3 % FSO	
Temperature coefficient [2]	Sensitivity	± 40 ppm / °C	
	Zero offset	≤ ± 200 ppm / °C	
Supply voltage		10.8 … 30 VDC	
Power consumption		< 1 W	
Temperature range	Operation	-40 … +85 °C	
	Storage	-40 … +85 °C	
Analog output		4 … 20 mA (max. 300 Ω) or 0.5 … 4.5 V (min. 1 kΩ)	
Protection class		IP 67 (connected)	
Shock		DIN EN 60068-2-27 (1000 g)	
Weight		40 g	
Material		(glass fiber-reinforced) polyamide	
Installation		Screw connection via mounting holes (M4)	
Connection		AMP Superseal 1.5 connector	

FSO = Full Scale Output
All specifications are typical for +25 °C, unless otherwise stated.
[1] Customer-specific designs are possible
[2] Typical with ambient temperatures between -40 … +85 °C





- *Highest accuracy and resolution for precise measurements*
- *Extremely stable measurement signal with strongly fluctuating temperatures*
- *High interference immunity with increased EMC requirements*
- *Ideal for integration into plant and machinery*
- *Customer-specific modifications*

Ideal for integration into plant and machinery

The analog ACC57 acceleration sensors are based on the MEMS technology and are therefore suitable for static and dynamic acceleration measurements. They detect accelerations in one, two or three axes. They are often used in applications requiring maximum precision in harsh ambient conditions.

The entire electronics is in a sealed aluminum die-cast housing and designed for ambient temperatures up to 125 °C. The high temperature stability enables the sensor to achieve high measurement accuracy even when surrounded by strongly fluctuating ambient temperatures. The housing offers excellent interference resistance for increased EMC requirements in close proximity to electromagnetic fields.

Fields of application

The high signal-to-noise distance enables the analog ACC57 sensors to measure even minor accelerations which occur, e.g., with tower oscillations of wind turbines, bearings and also measuring/calibration systems.

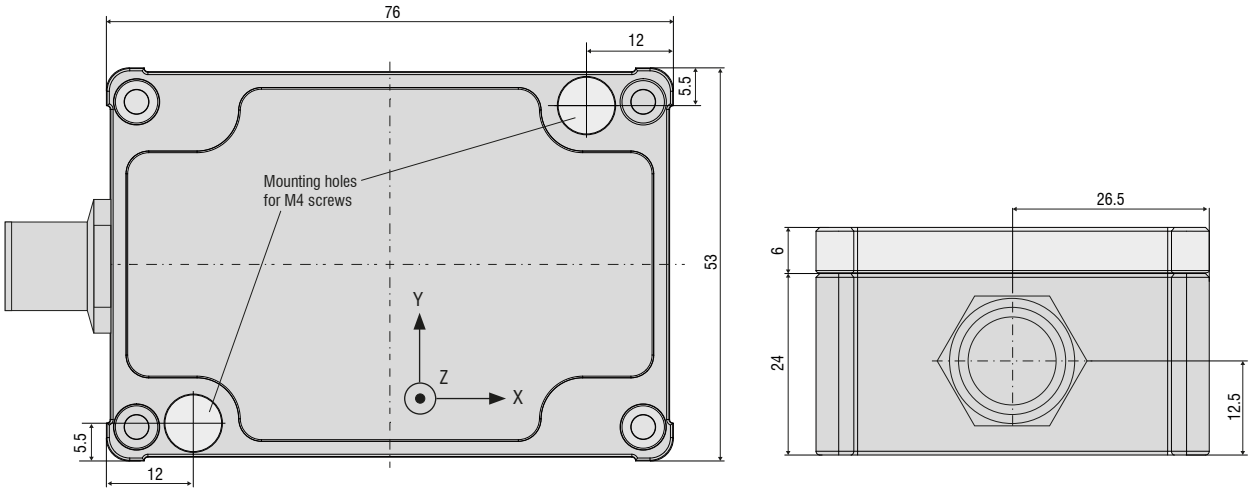
Its high EMC resistance makes the sensor ideally suitable for precise condition monitoring of electrical machines such as, e.g., generators. Combined with high temperature stability, the sensor is used in wind turbines to monitor the oscillations and vibrations of drive trains, rotor blades (ice detection) and generators (noise reduction).

Article designation

ACC570	3	-2	-SA	-I
				Output: I = 4 ... 20 mA, U = 0.5 ... 4.5 V
			Connection: SA = Connector axial	
		Measuring range in ± g		
	Number of axes			
High-precision acceleration sensor				

Model		ACC570x-1	ACC570x-2	ACC570x-4	ACC570x-8
Measuring axes		1, 2 or 3			
Measuring range		± 1 g	± 2 g	± 4 g	± 8 g
Noise		20 µg/√Hz			
Sensitivity (analog output)		8 mA/g	4 mA/g	2 mA/g	1 mA/g
Zero		12 mA or 2.5 V			
Linearity		0.15 % FSO			
Frequency range		0 … 1000 Hz			
Response time		1.1 ms			
Cross axis sensitivity		1 % FSO			
Temperature coefficient [1]	Sensitivity	± 30 ppm / °C			
	Zero offset	± 30 ppm / °C			
Supply voltage		12 … 32 VDC			
Power consumption		1 W			
Temperature range	Operation	-40 … +85 °C (optional 125 °C [2])			
	Storage	-40 … +85 °C (optional 125 °C [2])			
Measured value output	analog	4 … 20 mA (max. 500 Ω [3]) or 0.5 … 4.5 V (min. 1 kΩ) [4]			
Protection class		IP67 connected (optional IP68)			
Shock		DIN EN 60068-2-27 (1500 g, 0.5 ms, half-sine shock, 3x in each direction)			
Weight		250 g			
Material		Aluminum die-cast			
Installation		Screw connection via mounting holes (M4)			
Connection		5-pin M12 connector			
Start-up time		< 20 ms			

FSO = Full Scale Output
All specifications are typical for +25 °C, unless otherwise stated.
[1] Typical with ambient temperatures between -40 … +85 °C
[2] Customer-specific designs with high temperature cable up to 125° available
[3] With 24 VDC supply voltage
[4] Voltage output on request



inertialSENSOR ACC5703 digital

- *High resolution and temperature stability*
- *RS485 interface and freely scalable analog outputs (16 bit)*
- *Sampling rate up to 4 kHz*
- *Software (sensorTOOL) for visualization and detection of measured data*
- *Power supply via USB*

Ideal for accurate and temperature-resistant acceleration measurements with intelligent signal processing

The digital ACC57 acceleration sensor is based on the MEMS technology and is therefore suitable for static and dynamic acceleration measurements. The sensor detects accelerations in three axes.

The high temperature stability enables the sensors to achieve high measurement accuracy even when surrounded by strongly fluctuating ambient temperatures.

Available interfaces are RS485 and three freely scalable current and voltage outputs.

The Micro-Epsilon sensorTOOL software enables the user to set the high-pass and low-pass filters, the measuring range and the analog outputs depending on the respective application.

All settings are directly stored in the sensor while enabling intelligent signal processing.

Furthermore, the sensorTOOL can also be used for the visualization and detection of measured data, while the sensor is supplied via USB. Additional voltage supply is not required.

Fields of application

Due to their high signal stability and resolution, the sensors are applied in laboratories and industrial measurement tasks.

Due to the configuration possibility via software, the digital acceleration sensor can be ideally used for applications in industrial continuous operation and test benches.

These laser sensors are used, e.g., in measurement and monitoring tasks in factory automation, wind turbines, vehicles (road behavior and vehicle dynamics) and robotics.

Article designation

ACC570	3	-8	-SA	-RS485IU

-RS485IU: Output: RS485IU = RS485, 4 ... 20 mA and 0.5 ... 4.5 V

-SA: Connection: SA = Connector axial

-8: Measuring range in ± g

3: Number of axes

ACC570: High-precision acceleration sensor

Model		ACC5703-8-SA-RS485IU
Measuring axes		3
Measuring range		± 0.1 g … ± 8 g (freely adjustable) [1]
Noise		25 µg/√Hz
Sensitivity (analog output)		≤ 80 mA/g or ≤ 20 V/g [1]
Zero		12 mA or 2.5 V
Linearity		0.15 % FSO
Frequency range		0 … 1000 Hz (freely adjustable)
Sampling rate		≤ 4 kHz [2]
Response time		≥ 0.88 ms [2]
Cross axis sensitivity		1 % FSO
Temperature coefficient [3]	Sensitivity	± 30 ppm / °C
	Zero offset	± 30 ppm / °C
Supply voltage		5 … 32 VDC
Power consumption		1.5 W
Temperature range	Operation	-40 … +85 °C
	Storage	-40 … +85 °C
Measured value output	analog	4 … 20 mA (max. 390 Ω); 0.5 … 4.5 V (min.1 kΩ); 16 bits; freely scalable within the measuring range
	digital	RS485, Ethernet, PROFINET [4]
Switching output		max. three outputs: 0 / 5 V (min. 1 KΩ)
Protection class		IP67 (connected)
Shock		DIN EN 60068-2-27 (1500 g, 0.5 ms, half-sine shock, 3x in each direction)
Weight		approx. 250 g
Material		Aluminum die-cast
Installation		Screw connection via mounting holes (M4)
Connection		8-pin M12 connector
Start-up time		< 500 ms

FSO = Full Scale Output

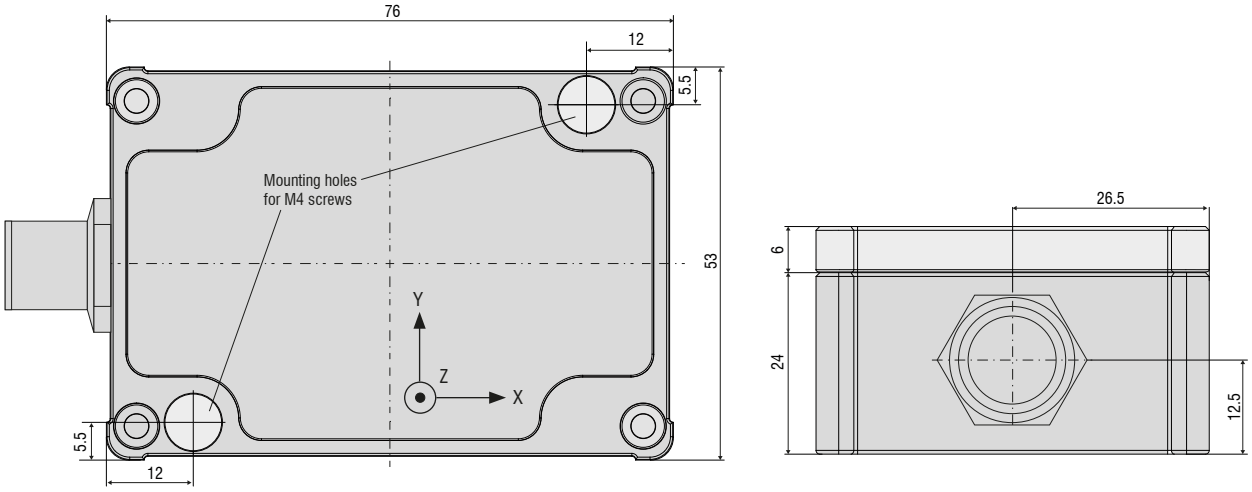
All specifications are typical for +25 °C, unless otherwise stated.

[1] In order to achieve maximum sensitivity, continuous adjustment of the measuring range is possible.
(Examples: measuring range ± 0.1 g → sensitivity 80 mA/g or 20 V/g; measuring range ± 8 g → sensitivity 1 mA/g or 0.25 V/g)

[2] Digital interface RS485 is enabled only up to 1000 Hz sampling rate. At higher rates only the analog output is active.
Sampling rate and response time depend on the low-pass filter setting (see inertialSENSOR ACC5703 operating instructions).

[3] Typ. with ambient temperatures between -40 … +85 °C

[4] In combination with the Micro-Epsilon interface modules IF1032 (Ethernet) and IF2030 (PROFINET)



Accessories/cables INC5701 and ACC5703-8-SA-RS485IU

29011159	PC3/8-M12	Supply/output cable, 3 m long
29011141	PC5/8-M12	Supply/output cable, 5 m long
29011285	PC10/8-M12	Supply/output cable, 10 m long
29011106	PC10/8-M12	Supply/output cable, drag-chain suitable, 10 m long
29011059	PC15/8-M12	Supply/output cable, drag-chain suitable, 15 m long
6965003	PC2/8-Sub-D	Supply/output cable with USB/RS485 converter, 2.8 m long

Accessories/cables ACC570x-x-SA-I/-U

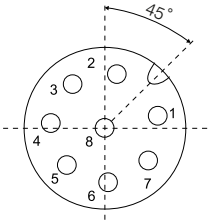
29011154	PC5/5-M12 IWT	Supply/output cable, 5 m long
29011116	PC10/5-M12	Supply/output cable, 10 m long
29011178	PC20/5-M12	Supply/signal cable, 20 m long
6965005	PC40/5-M12	Supply/output cable, 40 m long
6965006	PC80/5-M12	Supply/signal cablel, 80 m long

Accessories/cables ACC530x

6965001	PC4/4-AMP	Supply/output cable, 4 m long
6965002	PC10/4-AMP	Supply/output cable, 10 m long

Pin assignment INC5701 and ACC5703 digital

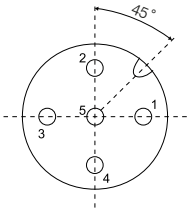
		INC5701	ACC5703-8-SA-RS485IU
Pin	**Cable color: PCx/8-M12)**	**Assignment**	**Assignment**
1	White	U (angle)	Output channel 2
2	Brown	GND (current)	GND (Output)
3	Green	I (angle)	Output channel 3
4	Yellow	RS485+	RS485+
5	Gray	GND (voltage)	Output channel 1
6	Black/pink	GND (supply)	GND (supply)
7	Blue	RS485-	RS485-
8	Red	Supply +	Supply +



View connector side

Pin assignment ACC570x analog

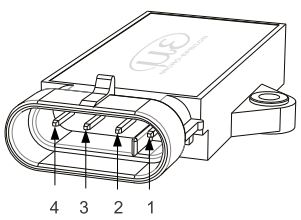
		ACC5701	ACC5702	ACC5703
Pin	**Cable color: PCx/5-M12**	**Assignment**	**Assignment**	**Assignment**
1	Brown	12 ... 32 VDC	12 ... 32 VDC	12 ... 32 VDC
2	White	GND	GND	GND
3	Blue	X out	X out	X out
4	Black	n.c.	Y out	Y out
5	Gray	n.c.	n.c.	Z out



View connector side

Pin assignment ACC530x

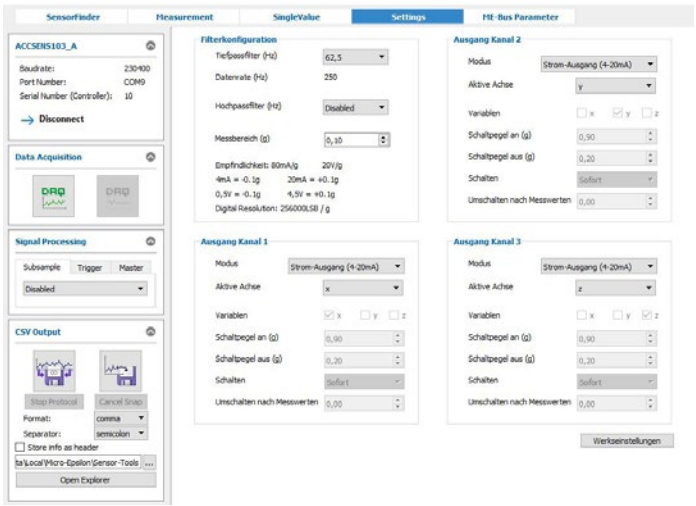
		ACC5301	ACC5302
Pin	**PCx/4-AMP**	**Assignment**	**Assignment**
1	1	n.c.	Y
2	2	X-axis	
3	3	GND	
4	4	Vcc	



Free configuration software

The configuration software from Micro-Epsilon offers simple setup and commissioning of the INC5701 and ACC5703 digital sensors. The software enables access to parameter set up and sensor configurations, e.g., measuring ranges and output parameters.

The software is available as a free download on www.micro-epsilon.com/download.

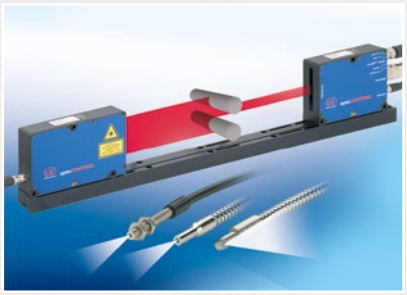


Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

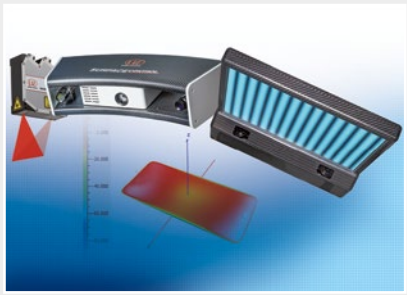
Sensors and measurement devices for non-contact temperature measurement

Measuring and inspection systems for metal strips, plastics and rubber



Optical micrometers and fiber optics, measuring and test amplifiers

Color recognition sensors, LED analyzers and inline color spectrometers



3D measurement technology for dimensional testing and surface inspection

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