

## TMS/TMM22

Compact inclination sensor for numerous applications

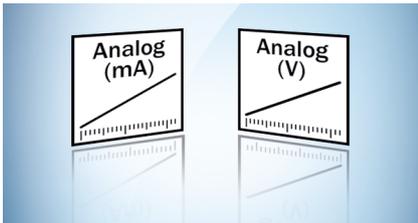
**SICK**  
Sensor Intelligence.

## Advantages



### Very flexible integration

The TMS/TMM22 transmits its precise inclination data to the system control via a linearized analog signal. For high compatibility, the sensor is available with common analog interfaces (0 V to 10 V and 4 mA to 20 mA). Parameterizable variants that can be tailored to the specific customer requirements are also available. Currently in planning: An extension to include digital interfaces such as IO-Link and CANopen. To make system integration as simple as possible, the sensor cable, which is permanently connected to the housing, is available either with a straight or angled M12 male connector, with open strands or a customized solution.



The TMS/TMM22 is available with the following interfaces as standard: 0 V to 10 V and 4 mA to 20 mA.



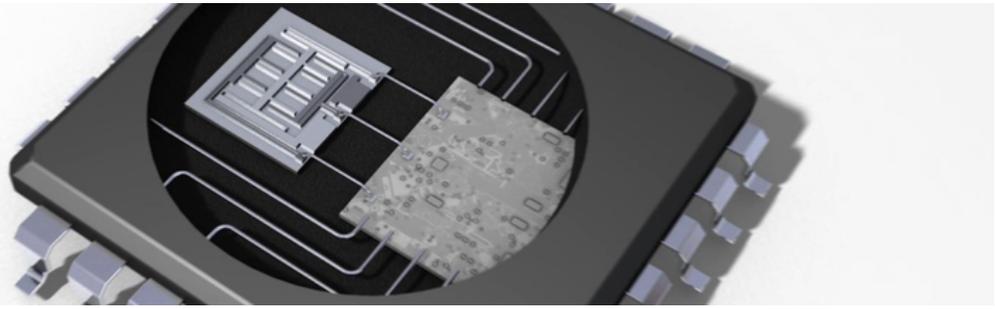
Flexible system integration thanks to common M12 male connector, as a variant with open strands or as a special design.



Compact design: At just 38.8 mm x 30 mm x 10.4 mm, the TMS/TMM22 fits into many applications.

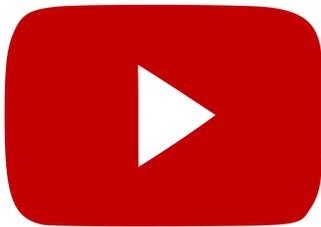


**Easy integration: The TMS/TMM22 fits effortlessly into existing systems thanks to its compact design, diverse interfaces and connection types.**



## More performance per volume

The TMS/TMM22 owes its compact dimensions and reliable measured values to so-called MEMS technology: The integrated acceleration sensor determines the inclination value by means of redundantly constructed microelectromechanical systems (MEMS) using very small capacitance changes between two silicon components. The measured value is then converted into a voltage signal and passed on to the system. The advantage: Thanks to MEMS technology, the TMS/TMM22 is wear-free, very durable, maintenance-free and resistant to vibrations and shocks.



This is how non-contact inclination measurement with MEMS technology works.



The TMS/TMM22 maintains a constant error tolerance of no greater than  $\pm 0.1^\circ$ .



Using the preset function, the sensor can be zeroed by the user and thereby quickly commissioned.



**Thanks to powerful MEMS technology, the TMS/TMM22 inclination sensor offers great precision with excellent cost-effectiveness.**



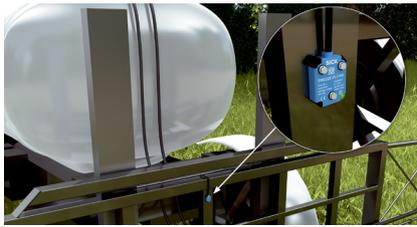
## At home in countless applications

The TMS/TMM22 enables the integration of reliable inclination data in a range of price-sensitive applications. For example, the sensor is ideal for sun tracking in photovoltaic systems. The inclination measurement forms the basis for exact alignment of the photovoltaic modules as well as for the control and correction of corresponding tracking systems. Since even a devia-

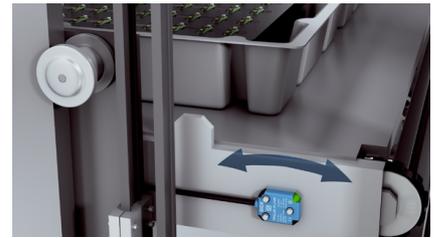
tion of 1° from the ideal angle significantly reduces the energy yield, a high degree of precision is required in addition to economic efficiency. In mobile and logistics applications, the TMS/TMM22 minimizes the risk of operational faults, thus ensuring a high reliability.



The automated tracking of photovoltaic modules in large solar parks can be implemented very economically thanks to direct inclination measurement with the TMS/TMM22.



Thanks to IP69K and compact dimensions, the sensor is ideally suited for simple leveling tasks in mobile machines.



With a height of only 10 mm, the TMS/TMM22 fits easily into vertical storage systems with limited space, where it reliably detects one-sided or uneven loading of trays.



**Whether in the solar industry, mobile machines or automated guided vehicle systems, the TMS/TMM22 performs simple leveling tasks and inclination measurements reliably and very economically.**



## Very tough

To ensure that neither dust nor moisture can damage the electronics of the TMS/TMM22, these are enclosed in a dust- and waterproof unit during housing injection molding. Together with the reliable MEMS technology, this makes the inclination sensor very robust. That means high temperature fluctuations, harsh ambient conditions or high-pressure cleaning with water jets do not pose any real challenges for it. Thanks to a permanently integrated cable, the TMS/TMM22 is approved according to enclosure rating IP69K. The laser inscription on its housing withstands even constant high levels of UV radiation, thereby enabling the sensor to always be clearly identified. Thanks to the 3-hole mounting, it sits well and can deliver high quality measured values.

IP66 IP68 IP69K

Ideal for harsh conditions: The fully-encapsulated electronics ensure the sensor meets the enclosure ratings IP66, IP68 and IP69K.



The type label remains clearly legible even when exposed to UV radiation, moisture or dust.



Strong temperature fluctuations or high UV exposure do not affect the accuracy of the inclination measurements.



**Whether used in deserts, with continuous vibrations or in high-pressure cleaning – thanks to its rugged design the TMS/TMM22 delivers consistently precise measured values, even under demanding conditions.**



### Technical data overview

<b>Number of axis</b>	1 / 2 (depends on variant)
<b>Communication interface</b>	Analog, Current Analog, Voltage
<b>Measurement range</b>	1-dimensional 5° ... 360° (depends on variant) 2-dimensional ± 5° ... ± 90° (depends on variant)
<b>Housing material</b>	Plastic (PA12), glass-fiber reinforced
<b>Connection type</b>	Cable, 5-wire, with male connector, M12, 5-pin, 0.3 m Cable, 5-wire, with male connector, M12, 5-pin, 1 m Cable, 5-wire, with male connector, M12, 5-pin, 10 m Cable, 5-wire, with male connector, M12, 5-pin, 5 m Cable, 5-wire, 1.5 m Cable, 5-wire, 3 m Cable, 5-wire, 10 m Cable, 5-wire, 0.3 m Cable, 5-wire, 0.5 m Cable, 5-wire, 5 m Cable, 5-wire, with male connector, M12, 5-pin, 3 m
<b>Programmable/configurable</b>	Over PGT-15
<b>Accuracy</b>	

### Product description

The TMS22 (single-axis) and TMM22 (dual-axis) inclination sensors provide very precise, cost-effective inclination measurements. The foundation for this is powerful MEMS technology, which scores points with an error tolerance of  $\pm 0.1^\circ$  and high repeatability. The measured values are output via a linearized analog signal. In order to meet the requirements on resistance for outdoor applications such as solar plants, the sensor electronics are embedded directly into the housing during injection molding. This means TMS/TMM22 devices comply with the requirements according to enclosure rating IP66, IP68 or IP69K. The compact design with a height of 10.4 mm also offers countless integration options. Sensor variants that can be parameterized on the user side are also available.

### At a glance

- Measuring range up to  $360^\circ$  (1-axis) or up to  $\pm 90^\circ$  (2-axis)
- Wear-free MEMS technology for high precision and signal quality
- Measurement accuracy: Up to  $\pm 0.1^\circ$
- Analog interfaces: 0 V to 10 V and 4 mA to 20 mA
- Enclosure ratings: IP66, IP68, IP69K
- Preset function for zeroing during installation
- Programmable variants

### Your benefits

- Precise one- or two-dimensional inclination measurement for cost-sensitive applications
- High reliability thanks to rugged sensor design with dust- and waterproof enclosed electronics
- High measuring certainty throughout the entire measuring range even under demanding ambient conditions thanks to optimized interference suppression
- Can be integrated into a wide range of applications thanks to the compact dimensions
- Analog output signal ensures compatibility in industrial environments
- Constant status information of the sensor thanks to visual LED feedback
- High flexibility thanks to many parameterization options

## Fields of application

- Photovoltaics and solar thermal energy
- Mobile agricultural and forestry machinery
- Vertical storage systems
- Crane and lifting technology
- Automated guided vehicle systems
- Construction machinery and special-purpose vehicles
- Wind power plants

## Ordering information

Other models and accessories → [www.sick.com/TMS\\_TMM22](http://www.sick.com/TMS_TMM22)

- **Communication interface:** Analog
- **Communication Interface detail:** Current
- **Current output:** 4 mA ... 20 mA
- **Housing material:** plastic (PA12), glass-fiber reinforced

Programmable/configurable	Number of axis	Measuring range	Type	Part no.
✓	1	120°	TMS22B-PKK120	1141312
		360°	TMS22B-PKE360	1139817
			TMS22B-PKF360	1142563
			TMS22B-PKG360	1129143
			TMS22B-PKH360	1140292
			TMS22B-PKJ360	On request
			TMS22B-PKK360	1142635
			TMS22B-PKL360	On request
			TMS22B-PKM360	1139994
			TMS22B-PKN360	1139991
	2	± 10°	TMM22B-PKG010	1147539
		± 90°	TMM22B-PKE090	1139818
			TMM22B-PKF090	On request
			TMM22B-PKG090	1124499
		TMM22B-PKH090	1140832	
		TMM22B-PKJ090	1141565	
		TMM22B-PKK090	1141685	
		TMM22B-PKL090	On request	
		TMM22B-PKM090	1151877	
		TMM22B-PKN090	1139992	
-	1	5°	TMS22E-PKH005	1128817
		10°	TMS22E-PKK010	1129365
			TMS22E-PKN010	1129363
		± 15°	TMS22E-PKH030S01	1135324
		45°	TMS22E-PKH045	1143986
			TMS22E-PKN045	1130964
60°	TMS22E-PKK060	1130502		
-	1	60°	TMS22E-PKN060	1134655
		80°	TMS22E-PKH080	1120743

Programmable/configurable	Number of axis	Measuring range	Type	Part no.	
		90°	TMS22E-PKH090	1122883	
			TMS22E-PKN090	1116342	
		120°	TMS22E-PKK120	1121983	
		180°	TMS22E-PKH180	1136781	
			TMS22E-PKN180	1127983	
		270°	TMS22E-PKN270	1129364	
		360°	TMS22E-PKG360	1116340	
			TMS22E-PKH360	1123685	
			TMS22E-PKL360	1121701	
		2	± 5°	TMM22E-PKH005	1134234
				TMM22E-PKH010	1116334
			± 10°	TMM22E-PKH010S55	1136688
	± 45°			TMM22E-PKG045	1122884
				TMM22E-PKH045	1116335
	TMM22E-PKH045S55			1136689	
	TMM22E-PKJ045			1117972	
	TMM22E-PKK045			1116343	
	TMM22E-PKN045			1122616	
	TMM22E-PKZ045S55		1136760		
	± 60°		TMM22E-PKH060	1116336	
			TMM22E-PKH060S55	1136690	
		TMM22E-PKJ060	1117973		
		TMM22E-PKK060	1121982		
	± 90°	TMM22E-PKF090	1120612		
TMM22E-PKG090		1116345			
TMM22E-PKH090		1116338			
TMM22E-PKJ090		1118561			
TMM22E-PKK090		1126910			

- **Communication interface:** Analog
- **Communication Interface detail:** Voltage
- **Housing material:** plastic (PA12), glass-fiber reinforced

Programma-ble/configurable	Voltage output	Number of axis	Measuring range	Type	Part no.
✓	0 V ... 10 V	1	360°	TMS22B-PLG360	1129144
				TMS22B-PLH360	1140845
				TMS22B-PLJ360	On request
				TMS22B-PLM360	1145895
		2	± 90°	TMM22B-PLG090	1124548
				TMM22B-PLH090	1141710
				TMM22B-PLJ090	1147821
				TMM22B-PLM090	1144295
-	0 V ... 10 V	1	45°	TMS22E-PLK045	1131583
			60°	TMS22E-PLK060	1131586
			90°	TMS22E-PLH090	1128922
				TMS22E-PLN090	1128923
			120°	TMS22E-PLG120	1120611
			180°	TMS22E-PLH180	1124311
				TMS22E-PLJ180	1116341
				TMS22E-PLN180	1144811
			240°	TMS22E-PLH240	1131884
			360°	TMS22E-PLH360	1131130
		2	± 10°	TMM22E-PLH010	1116303
				TMM22E-PLH010S55	1136692
			± 45°	TMM22E-PLH045	1116332
				TMM22E-PLH045S55	1136693
				TMM22E-PLN045	1128925
			± 60°	TMM22E-PLH060	1116333
				TMM22E-PLH060S55	1136694
			± 90°	TMM22E-PLG090	1116575
				TMM22E-PLH090	1116337
				TMM22E-PLM090	1121189
0 V ... 5 V	2	± 45°	TMM22E-PNK045	1121327	

## SICK AT A GLANCE

SICK is one of the leading manufacturers of intelligent sensors and sensor solutions for industrial applications. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in a wide range of industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

Comprehensive services complete our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

For us, that is “Sensor Intelligence.”

## WORLDWIDE PRESENCE:

Contacts and other locations –[www.sick.com](http://www.sick.com)