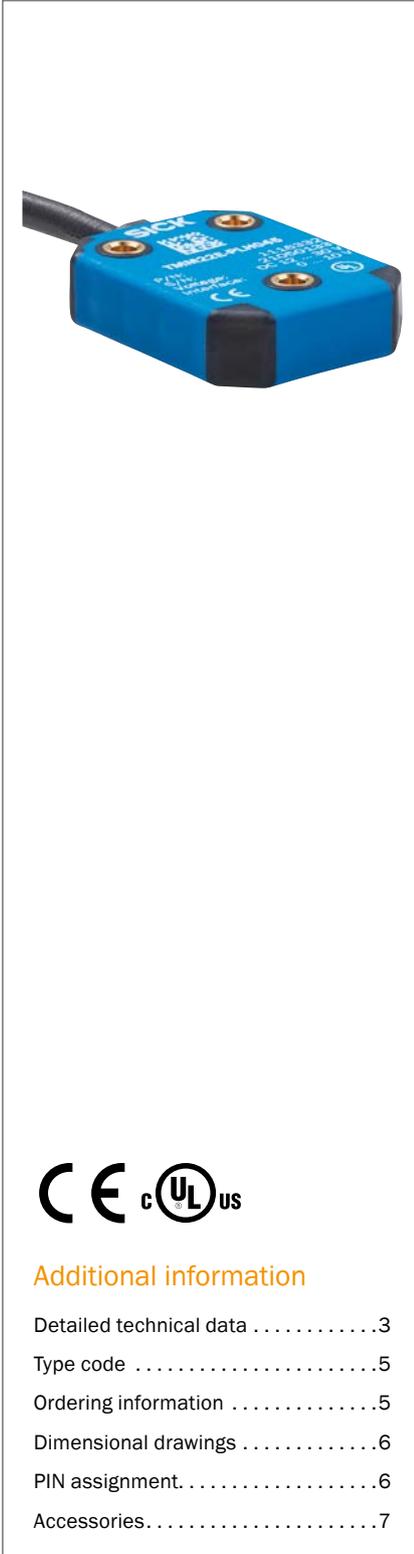# TMS/TMM22

THE RUGGED ALL-ROUNDER FOR INCLINATION MEASUREMENT

Inclination sensors

THE RUGGED ALL-ROUNDER FOR INCLINATION MEASUREMENT

Product description

The TMS22 (single-axis) and TMM22 (dual-axis) inclination sensors provide cost-effective, high-precision inclination measurements. The foundation for this is powerful MEMS technology, which scores points with a maximum error tolerance of ± 0.25° and excellent repeatability. The measured values are output via a linearized analog signal. In order to meet the highest requirements in terms of resistance for outdoor applications such as PV systems, the sensor electronics are embedded directly into the housing during injection molding. Therefore, TMS/TMM22 devices comply with the regulations according to enclosure rating IP66, IP68 or IP69K. The compact design with a height of just 10.4 mm also makes nearly unlimited integration options possible.

At a glance

- Measuring range of up to 360° (1-axis) or up to ± 90° (2-axis)
- Wear-free MEMS technology for consistently high precision and signal quality
- Measurement accuracy: ± 0.25°
- Analog interfaces 0 to 10 V and 4 to 20 mA available or customizable
- Enclosure ratings IP66, IP68 and IP69K
- Preset function for zeroing during installation

Your benefits

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

Additional information

➜ www.sick.com/TMS_TMM22

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.

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

Detailed technical data

Performance

Number of axis		1 2
Measuring range		
	1-dimensional	360°
	2-dimensional	± 90°
Resolution		
	1-dimensional	≤ 0.03°
	2-dimensional	≤ 0.015°
Error limits G		
	1-dimensional	Typ. 0.25°, max. 0.4° [1]
	2-dimensional	Typ. 0.25°, max. 0.6° [1]
Repeatability standard deviation σ$_r$		
	Analog / 4...20 mA	30 µA [2]
	Analog / 0...10 V	30 mV [2]
Compensated cross-sensitivity (2-dimensional)		Typ. ± 0.5°, max. ± 0.9°
Temperature coefficient (zero point)		±0.03°/K
Limit frequency		2 Hz
Sampling rate		400 Hz

[1] In accordance with DIN ISO 1319-1, position of the upper and lower error limit depends on the installation situation, specified value refers to a symmetrical position, i.e. deviation in upper and lower direction is the same.

[2] In accordance with DIN ISO 55350-13; 68.3% of the measured values are inside the specified area.

Interfaces

Communication interface		Analog / 4...20 mA Analog / 0...10 V
0-set function via hardware pin		✔
Load resistance		200 Ω ... 900 Ω [1]
Status information		
	LED	2x (green/red)
	Output signal (error state)	2...3 mA 0 V
Initialization time		250 ms

[1] At 24 V DC. Value depends on supply voltage and can be taken from the operating instructions.

Electrical data

Connection type	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, 5 m Cable, 5-wire, with male connector, M12, 5-pin, 10 m Cable, 5-wire, 0.3 m Cable, 5-wire, 1.5 m Cable, 5-wire, 3 m Cable, 5-wire, 5 m Cable, 5-wire, 10 m
Supply voltage	12 V DC ... 30 V DC
Current consumption	
4...20 mA	< 50 mA (+ I_{loop}) @ 24 V
0...10 V	< 50 mA @ 24 V
Reverse polarity protection	✔
Short-circuit protection of the outputs	✔
MTTFd: mean time to dangerous failure	961 years (EN ISO 13849-1) [1]

[1] This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of components, average ambient temperature 40°C, frequency of use 8760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.
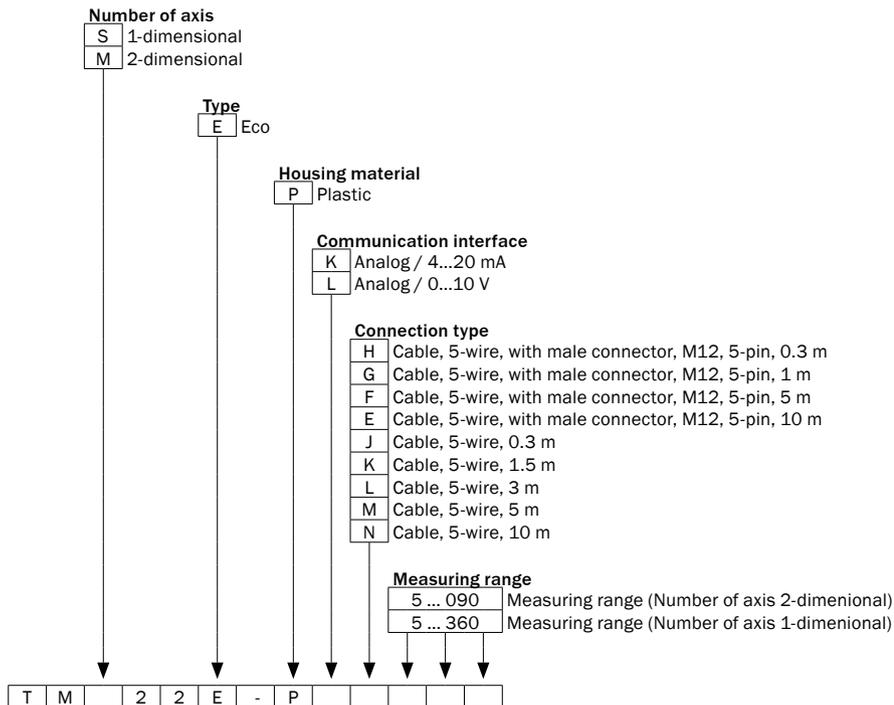
Mechanical data

Dimensions	38.8 mm x 30 mm x 10.4 mm
Weight	Approx. 60 g
Housing material	Plastic (PA12), glass-fiber reinforced
Material, cable	PUR

Ambient data

|	
EMC	EN 61326-1
Enclosure rating	IP66, IP67, IP68, IP69K
Operating temperature range	–40 °C ... +80 °C
Storage temperature range	–40 °C ... +85 °C
Resistance to shocks	100 g, 6 ms (according to EN 60068-2-27)
Resistance to vibration	10 g, 10 Hz ... 2,000 Hz (according to EN 60068-2-6)

Type code

	Number of axis	
	S	1-dimensional
	M	2-dimensional

	Type	
	E	Eco

	Housing material	
	P	Plastic

	Communication interface	
	K	Analog / 4...20 mA
	L	Analog / 0...10 V

	Connection type	
	H	Cable, 5-wire, with male connector, M12, 5-pin, 0.3 m
	G	Cable, 5-wire, with male connector, M12, 5-pin, 1 m
	F	Cable, 5-wire, with male connector, M12, 5-pin, 5 m
	E	Cable, 5-wire, with male connector, M12, 5-pin, 10 m
	J	Cable, 5-wire, 0.3 m
	K	Cable, 5-wire, 1.5 m
	L	Cable, 5-wire, 3 m
	M	Cable, 5-wire, 5 m
	N	Cable, 5-wire, 10 m

	Measuring range	
	5 ... 090	Measuring range (Number of axis 2-dimenional)
	5 ... 360	Measuring range (Number of axis 1-dimenional)

T	M	2	2	E	-	P						

Ordering information

Number of axis	Measuring range	Connection type	Communication interface	Type	Part no.
1-dimensional	90°	Cable, 10 m	Analog, 4...20 mA	TMS22E-PKN090	1116342
	180°	Cable, 0.3 m	Analog, 0...10 V	TMS22E-PLJ180	1116341
	360°	Cable, with male connector, 1 m	Analog, 4...20 mA	TMS22E-PKG360	1116340
2-dimensional	± 10°	Cable, with male connector, 0.3 m	Analog, 0...10 V	TMM22E-PLH010	1116303
			Analog, 4...20 mA	TMM22E-PKH010	1116334
	± 45°	Cable, 1.5 m	Analog, 4...20 mA	TMM22E-PKK045	1116343
		Cable, with male connector, 0.3 m	Analog, 0...10 V	TMM22E-PLH045	1116332
			Analog, 4...20 mA	TMM22E-PKH045	1116335
	± 60°	Cable, with male connector, 0.3 m	Analog, 0...10 V	TMM22E-PLH060	1116333
			Analog, 4...20 mA	TMM22E-PKH060	1116336
	± 90°	Cable, with male connector, 0.3 m	Analog, 0...10 V	TMM22E-PLH090	1116337
			Analog, 4...20 mA	TMM22E-PKH090	1116338
		Cable, with male connector, 1 m	Analog, 0...10 V	TMM22E-PLG090	1116575
			Analog, 4...20 mA	TMM22E-PKG090	1116345

Dimensional drawings (Dimensions in mm (inch))
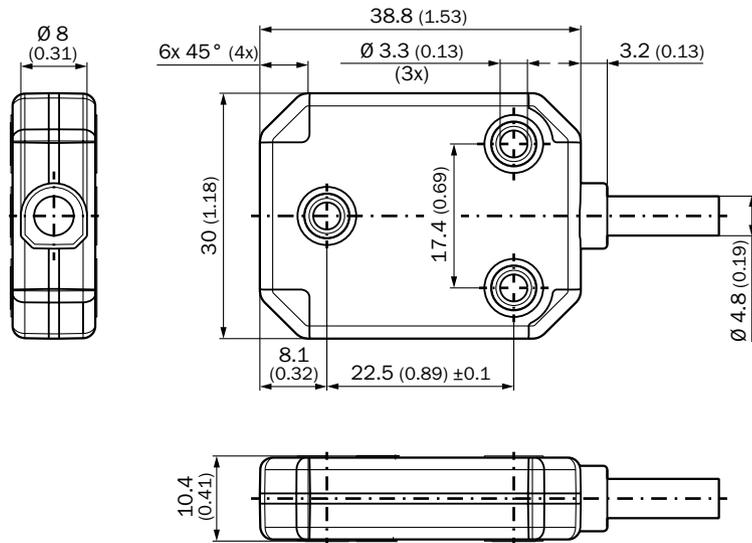
PIN assignment
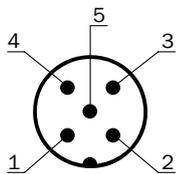
PIN Male connector M12, 5-pin	Wire colors (cable connection) Cable connection	Signal TMS22	Signal TMM22
1	Brown	U$_S$	U$_S$
2	White	Z-axis	Y-axis
3	Blue	GND	GND
4	Black	N.c.	X-axis
5	Gray	TEACH [1]	TEACH [1]

[1] To activate the zero point setting, connect TEACH (pin 5) to GND (pin 3) for at least 1 second.

Accessories

Plug connectors and cables

Plug connectors and cables

Connecting cables

Figure	Brief description	Length of cable	Type	Part no.
	Head A: female connector, M12, 5-pin, straight, A-coded Head B: Flying leads Cable: Sensor/actuator cable, PUR, halogen-free, shielded, 0.34 mm², 5.6 mm Signalart: Sensor/actuator cable	1.5 m	YF2A25-015UB6X-LEAX	2095833
		3 m	YF2A25-030UB6X-LEAX	2095834
		5 m	YF2A25-050UB6X-LEAX	2095733
		10 m	YF2A25-100UB6X-LEAX	2095734
		20 m	YF2A25-200UB6X-LEAX	2095738
	Head A: female connector, M12, 5-pin, angled, A-coded Head B: Flying leads Cable: Sensor/actuator cable, PUR, halogen-free, shielded, 0.34 mm², 5.6 mm Signalart: Sensor/actuator cable	3 m	YG2A25-030UB6X-LEAX	2095791
		5 m	YG2A25-050UB6X-LEAX	2095792
		10 m	YG2A25-100UB6X-LEAX	2095793

Field-attachable connectors

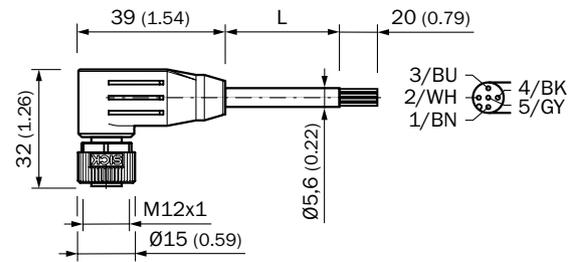| Figure	Brief description	Type	Part no.
	Head A: female connector, M12, 5-pin, straight Cable: unshielded	DOS-1205-G	6009719
	Head A: male connector, M12, 5-pin, straight Cable: unshielded Details: for field bus technology	STE-1205-G	6022083

Dimensional drawings for accessories (Dimensions in mm (inch))
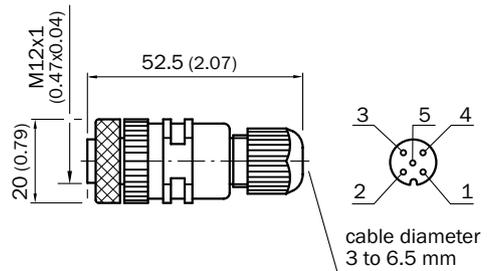
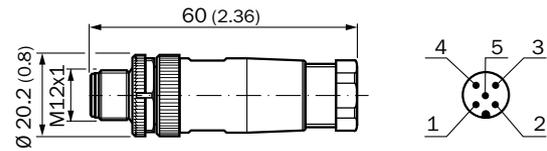### Plug connectors and cables

YF2A25-xxxUB6XLEAX
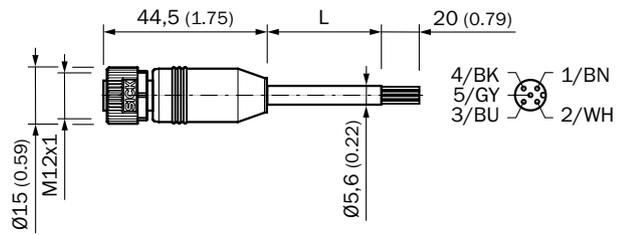
YG2A25-xx0UB6XLEAX

DOS-1205-G

STE-1205-G

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