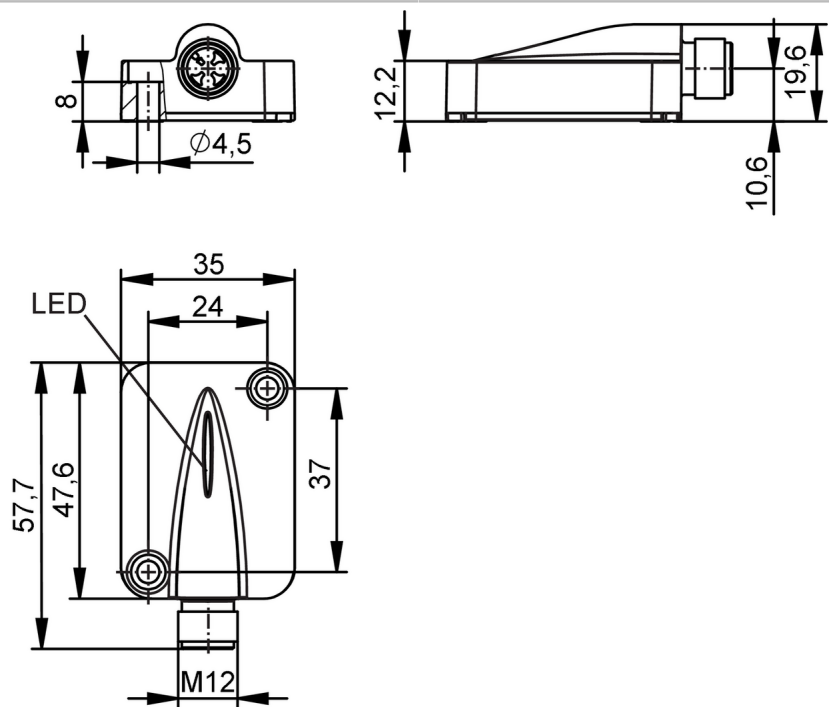




Dynamic inclination sensor

INC-K2M180BIAKG/US-H



Product characteristics

Measuring principle	MEMS capacitive; (3D-accelerometer ; 3D-gyroscope)
Communication interface	IO-Link
Housing	rectangular
Inclination measurement	
Number of measurement axes	2; (Roll + Pitch, depending on the installation position)
Angular range [°]	± 90; (complete 360° measurement)
Acceleration measurement	
Number of measurement axes	3
Yaw rate measurement	
Number of measurement axes	3

Application

Design	dynamic inclination sensor for horizontal installation position
Function principle	dynamic
Application	use in mobile and industrial applications

Electrical data

Operating voltage [V]	9...32 DC; (IO-Link: 18...30 DC); (to SELV/PELV: energy-limited circuits according to IEC/UL 61010-1 3rd ed. cl. 9.4)
Nominal voltage DC [V]	12...24
Current consumption [mA]	< 20; (without load 12 V)
Min. insulation resistance [MΩ]	100; (500 V DC)
Protection class	III



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Reverse polarity protection	yes
Reverse polarity protection	yes
Overvoltage category	II
Power-on delay time [s]	< 0.1
Inputs / outputs	
Number of inputs and outputs	Number of digital inputs: 1; Number of digital outputs: 2
Inputs	
Number of digital inputs	1; (teach input)
Outputs	
Output signal	IO-Link; switching signal
Electrical design	PNP/NPN; (configurable)
Number of digital outputs	2
Output function	normally open / normally closed; (configurable)
Max. voltage drop switching output DC [V]	2
Permanent current rating of switching output DC [mA]	100
Short-circuit protection	yes
Type of short-circuit protection	pulsed
Overload protection	yes
Inclination measurement	
Frequency of the output [Hz]	250; (4 ms)
Measuring/setting range	
Measuring principle	MEMS capacitive; (3D-accelerometer ; 3D-gyroscope)
Inclination measurement	
Number of measurement axes	2; (Roll + Pitch, depending on the installation position)
Angular range [°]	± 90; (complete 360° measurement)
Acceleration measurement	
Frequency range [Hz]	50
Number of measurement axes	3
Measuring range acceleration [g]	± 8
Resolution [g]	0.001
Yaw rate measurement	
Number of measurement axes	3
Measuring range vehicle yaw rate [°/s]	± 1000
Temperature measurement	
Measuring range [°C]	-40...85
Resolution [°C]	0.1



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Accuracy / deviations		
Inclination measurement		
Repeatability	[°]	± 0,05
Resolution	[°]	0.01
Temperature coefficient	[1/K]	≤ ± 0,005°
Yaw rate measurement		
Resolution	[°]	0.01
Temperature measurement		
Accuracy	[K]	± 5,0
Dynamic measurement		
Accuracy	[°]	± 0,5
Static measurement		
Accuracy	[°]	± 0,25
Software / programming		
Parameter setting options	Installation position; application profiles; detection of measuring range exceedance / acceleration; ECO-Mode; Teach function; inversion and swapping of the process values	
Diagnostic functions	self-test	
Interfaces		
Communication interface	IO-Link	
Transmission type	COM3 (230,4 kBaud)	
IO-Link revision	1.1.4	
SDCI standard	IEC 61131-9: 2019-06	
Profiles	Smart Sensor - SSP 4.3.2	Measuring and Switching Sensor, floating point, 2 channel
	BLOB	Binary Large Object transfer
	Common - I&D	Identification and Diagnosis
	Extension	Quantity detection, switches when value exceeds the setpoint
	Function	Locator
	Function	ProductURI
SIO mode	yes	
Required master port type	A	
Min. process cycle time	[ms]	1.4
IO-Link process data (cyclical)	function	bit length
	Pitch	32
	Roll	32
	device status	4
	measuring range exceedance / acceleration	1
	SSC1.1	1
	SSC1.2	1
	SSC2.1	1
	SSC2.2	1
IO-Link functions (acyclical)	temperature measurement; detection of measuring range exceedance / acceleration; operating hours counter; Installation position; application profiles; LP filter; raw data; Hysteresis; window; switch points; switching logic; self-test	



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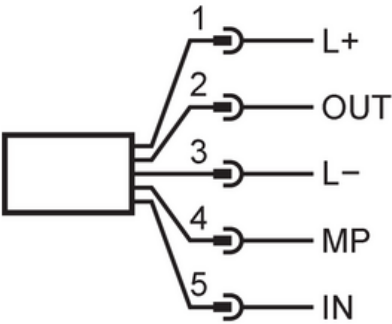
Supported DeviceIDs	Type of operation	DeviceID
	default	1827
Note	For further information please see the IODD PDF file under "Downloads"	
Operating conditions		
Ambient temperature	[°C]	-40...80
Storage temperature	[°C]	-40...85
Max. relative air humidity	[%]	90; (non condensing)
Max. height above sea level	[m]	5000
Protection	IP 6K7; IP 6K8; IP 6K9K; (ISO 20653)	
UV radiation	ISO 16750-4, DIN ISO 4892-2	
Chemical media	ISO 16750-5	AA, AB, AC, BA, BB, BC, BE, BF, CC, DA, DB
		chemical resistance of the plastics ; only one chemical permitted at a time
Tests / approvals		
EMC	EN IEC 61000-6-2	immunity / industrial environments
	EN IEC 61000-6-3	noise emission in domestic areas
	EN IEC 61326-2	electrical equipment for measurement, control and laboratory use
	DIN EN 12895	industrial trucks
	DIN ISO 16750-2	pulse 5 (load dump)
Shock resistance	DIN EN 60068-2-27	30 g 6 ms half-sine; 2000 shocks each in every direction of the 6 load axes / Tmin + Tmax
	ISO 16750-3	
	DIN EN 60068-2-27	500-600 g 1 ms half-sine; 3 impacts each in every direction of the 6 load axes
Vibration resistance	DIN EN 60068-2-6	10 g / (10...2000 Hz) 10 frequency cycles in 3 axes
	DIN EN 60068-2-64	5.79 g RMS / (10...2000 Hz) 32 hours in 3 axes
Climatic tests	DIN EN 60068-2-14	
Damp heat	ISO 16750-4	
	IEC 60068-2-38	
MTTF	[years]	282
UL approval	Ta	-40...65 °C
	Enclosure type	Type 1 / IP 67
	File number UL	E364788
Mechanical data		
Weight	[g]	38.4
Housing		rectangular
Type of mounting		screw mounting; (2 x M4)
Dimensions	[mm]	57.7 x 35 x 19.6
Materials		housing: PA glass fibre reinforced; Fixing element: stainless steel (303/1.4305)
Inclination measurement		
Installation position		horizontal
Plug		
Tightening torque	[Nm]	0.6...1.5



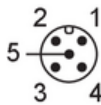
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Sensor		
Tightening torque	[Nm]	2.4
Displays / operating elements		
Display	operation	1 x LED, green
	switching status, Teach function	1 x LED, yellow
	fault	1 x LED, red
Operating elements	1 x	Teach-Taste
Accessories		
Items supplied	Torx-cylinder head bolt: 2 x M4 x 14, Screw retention	
	drilling template	
Remarks		
Pack quantity	1 pcs.	
Electrical connection		
Connection		



Connector: 1 x M12; coding: A; Contacts: 5; Maximum cable length: 20 m



1	L+	
2	OUT	DO2 (Pitch)
3	L-	
4	MP	DO1, IO-Link (Roll)
5	IN	DI, teach input

DO: digital output; MP: multi-function connection; DI: digital input

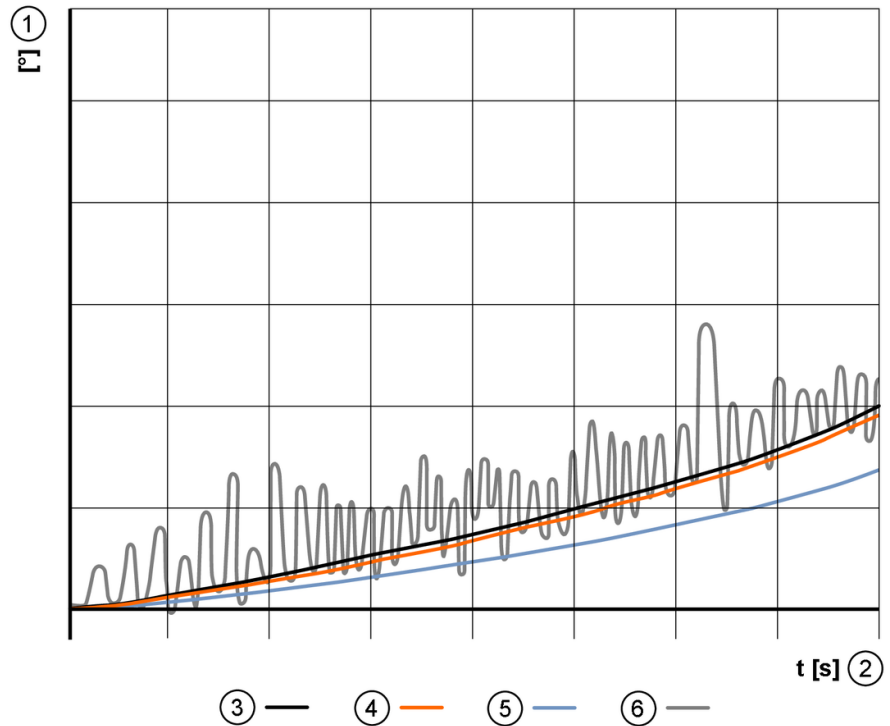


Dynamic inclination sensor

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Diagrams and graphs

vibration compensation curve



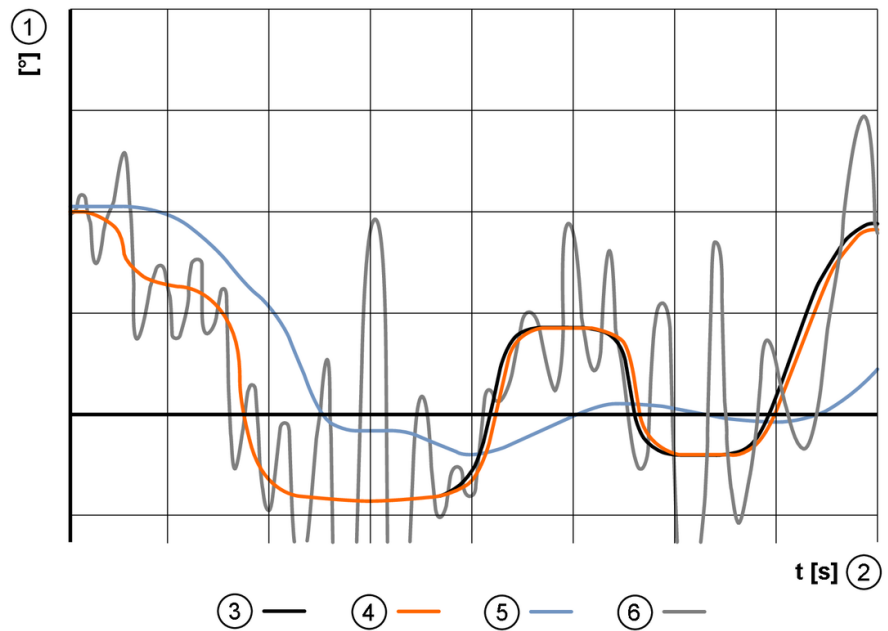
- 1: angle
- 2: time
- 3: reference line
- 4: JBC
- 5: filtered
- 6: unfiltered



Dynamic inclination sensor

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shock compensation curve

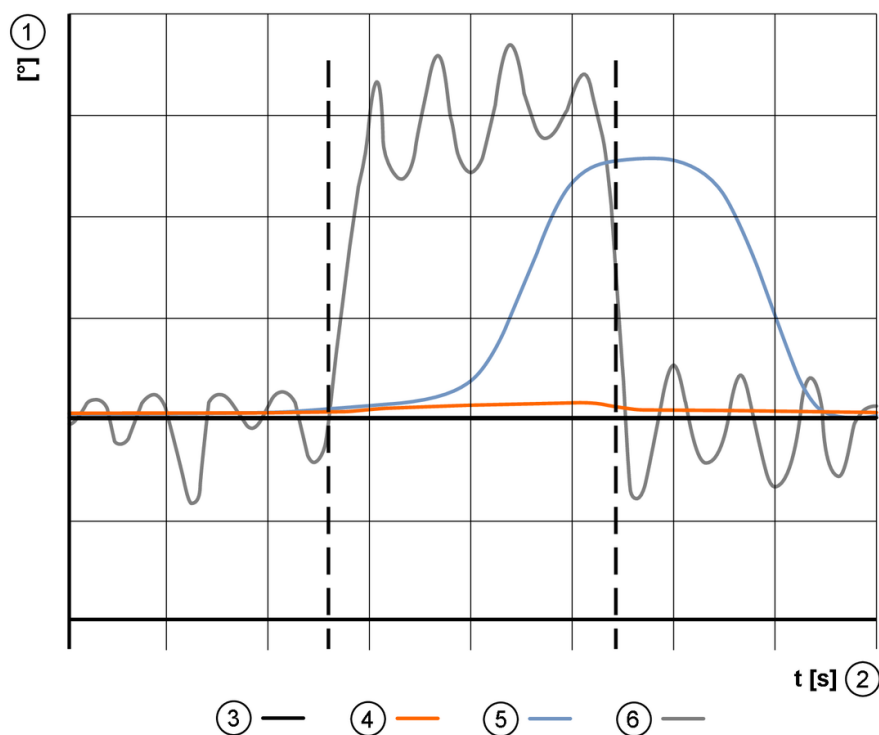


- 1: angle
- 2: time
- 3: reference line
- 4: JBC
- 5: filtered
- 6: unfiltered

Dynamic inclination sensor

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centrifugal force compensation curve



- 1: angle
- 2: time
- 3: reference line
- 4: JBC
- 5: filtered
- 6: unfiltered

horizontal installation position

