positilt®
Inclination sensors

PTM29

High-precision inclination sensor with robust, compact stainless steel housing

- **Measurement range up to ±180°**
- **Resolution up to 0.001°**
- **Protection class up to IP69**
- **Hermetically sealed stainless steel housing**
- **Longitudinal water barrier; potted electronics**
- **Wear-free MEMS technology, shock resistant**

Product versions

Analog output

Digital output CAN

V / mA

PTM29 - Inclination sensor in MEMS technology

Version with analog output

Specifications

			Order options
Number and orientation of inclination axes	Inclination in X axis, orientation 1A Inclination in X axis, orientation 1B Inclination in X axis, orientation 1C Inclination in X and Y axes, orientation 2A Inclination in X and Y axes, orientation 2B Inclination inX and Y axes, orientation 2C	1	**1A** **1B** **1C** **2A** **2B** **2C**
Measurement range	±5 ... 180° (selectable in 5° increments)	2	**5 ... 180**
Output	Voltage 0.5 ... 4.5 V (U_B = 24 V) Voltage 0.5 ... 10 V (on request) Voltage 0.5 ... 4.5 V (U_B = 5 V) (on request) Current 4 ... 20 mA, 3 wire (on request)	3	**U8** **U2 (on request)** **U6 (on request)** **I1 (on request)**
Signal characteristics	Increasing signal for CW inclination Increasing signal for CCW inclination	4	**CW** **CCW**
Resolution	0.005° (measurement range ±180°) 0.001° (measurement range ±5°)		
Linearity	±0.05° (up to ±30°) ±0.1° (up to ±60°) ±0.2° (up to ±180°)		
Housing material	Stainless steel EN 1.4404 (AISI 316L)		
Mounting	Screws M4: DIN 912, DIN 6912, DIN 7984		
Protection class	up to IP69		
Output delay	0.1 s ... 10 s / 90%	5	**T0.1 ... T10.0**
Connection	Cable, standard length 2 m	6	**KAB2M**
Shock	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks		
Vibration	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles		
Temperature range	-40° ... +85°C		
Weight	approx. 80 g (without cable)		
EMC	DIN EN 61326-1:2013		

Order code

PTM29 – 1 – 2 – 3 – 4 – 5 – 6

Order example: PTM29 – 1A – 180 – U8 – CW – T1.0 – KAB2M

CAN

PTM29 - Inclination sensor in MEMS technology

Version with digital output CAN

Specifications

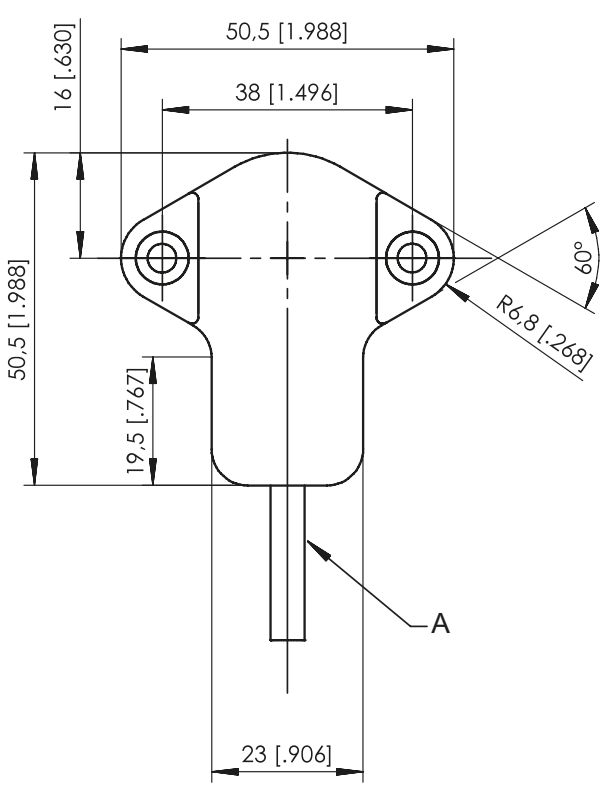
			Order options
Output	CANopen SAE J1939	1	**CANOP** **CANJ1939**
Measurement range	±180°		
Resolution	≥0.01° Adjustable by the user		
Linearity	±0.05° (up to ±30°) ±0.1° (up to ±60°) ±0.2° (up to ±180°)		
Housing material	Stainless steel EN 1.4404 (AISI 316L)		
Mounting	Screws M4: DIN 912, DIN 6912, DIN 7984		
Protection class	up to IP69		
Output delay	0.1 s ... 10 s / 90%, configurable		
Connection	Cable 0.3 m with connector M12, 5 pin	2	**KAB0,3M – M12/CAN**
Shock	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks		
Vibration	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles		
Temperature range	-40° ... +85°C		
Weight	approx. 80 g (without cable)		
EMC	DIN EN 61326-1:2013		

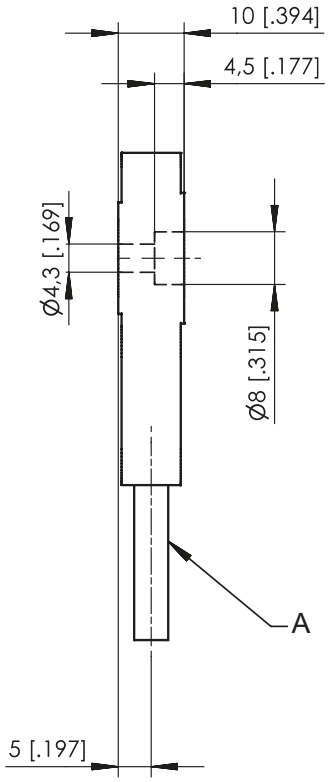
Order code

PTM29 – 1 – 2

Order example: PTM29 – CANOP – KAB0,3M – M12/CAN

Dimensions





A – Cable

Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions consult factory.

Output specification

Analog output

U2 Voltage output 0.5 ... 10 V 	Excitation voltage	8 … 36 V DC
	Excitation current	typical 12 mA max. 16 mA
	Output voltage	0.5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

U8 Voltage output 0.5 … 4,5 V 	Excitation voltage	8 … 36 V DC
	Excitation current	typical 12 mA max. 16 mA
	Output voltage	0.5 … 4,5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

U6 Voltage output 0.5 … 4.5 V 	Excitation voltage	5 V DC ±10 %
	Excitation current	typical 13 mA max. 16 mA
	Output voltage	10 … 90 % of the excitation voltage
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

I1 Current output 4 … 20 mA, 3 wires 	Excitation voltage	8 … 36 V DC
	Excitation current	typical 32 mA max. 36 mA
	Load R_L	500 Ω max.
	Output current	4 … 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

Signal wiring 1 axis	**Output signals**	**Cable color**
	$+U_B$ (excitation voltage)	brown
	Output X	white
	GND	blue
	Do not connect!	grey

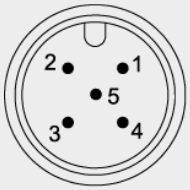
Signal wiring 2 axes	**Output signals**	**Cable color**
	$+U_B$ (excitation voltage)	brown
	Output X	white
	GND	blue
	OUTPUT Y	black
	Do not connect!	grey

Digital output CANopen

CANOP CANopen	Communication profile	CANopen CiA 301, Slave
	Encoder profile	CiA 410, Profile „Inclinometer“
	Configuration services	LSS, CiA Draft Standard 305 (Transmission rate, node ID)
	Error Control	Node guarding, Heartbeat, Emergency message
	Node ID	Adjustable via LSS or SDO, default: 127
	PDO	1 TxPDO, 0 RxPDO, no linking, static mapping
	PDO Modes	Event-/Time triggered, Remote-request, Sync cyclic/acyclic
	SDO	1 Server, 0 Client
	Certified	yes
	Transmission rate	125 kBit … 1 Mbit, adjustable via LSS or SDO, default: 125 kBit
	Bus connection	M12 conncector, 5 pin
	Bus, galvanic isolated	no
	Error Control Baudrate	50 kBit/s … 1 MBit/s configurable
	Transceiver	24V-compliant, not isolated
	Internal termination resistor	120 Ohm configurable

Specifications	Excitation voltage	8 ... 36 V DC
	Excitation current	15 mA typical at 24 V DC 30 mA typical at 12 V DC 100 mA max.
	Measuring rate	0.5 kHz standard
	Stability (temperature)	± 0,2° (-20 … +40 °C) ± 0,4° (-40 … +85 °C)
	Repeatability	1 LSB
	Operating temperature	-40 … +85 °C
	Protection	Reverse polarity, short circuit
	EMC	DIN EN 61326-1:2013

Signal wiring
Connector M12, 5 pin



View to the sensor connector

Output signals	Connector pin no.
Shield	1
Excitation +	2
GND	3
CAN-H	4
CAN-L	5

Digital output SAE J1939

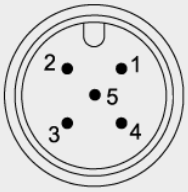
CANJ1939 SAE J1939 	CAN Specification	ISO 11898, Basic and Full CAN 2.0 B extended message format with 29-bit identifier
	Transceiver	24V-compliant, not isolated
	Communication profile	SAE J1939, 29-bit identifier
	Transmission rate	250 kBit/s
	Internal termination resistor	120 Ω
	Address	Default 247d, configurable

NAME - Unique device identifier	**Name Fields**	**Remark**	**Field value**	**Size [Bit]**	**Byte order**	**Byte value**
	Arbitrary Address Capable	No	0	1	Byte 8 (MSB)	00h
	Industry Group	Global	0	3		
	Vehicle System instance		0	4		
	Vehicle System	Non specific	7Fh	7	Byte 7	FEh
	Reserved		0	1		
	Function	Non specific	FFh	8	Byte 6	FFh
	Function Instance		0	5	Byte 5	00
	ECU Instance		0	3		
	Manufacturer	Manufacturer Code	145h	11	Byte 4	28h
					Byte 3	A0h+nn
		Identity Number	n..nh	21		
					Byte 2	nnh
					Byte 1	nnh

Proprietary PGN - Manufacturer specific Parameter Group Numbers			
	Configuration data	PGN EFddh	Proprietary-A (PDU1 peer-to-peer)
	Process data	PGN FFnnh	Proprietary-B (PDU2 broadcast); nn Group Extension (PS) configurable

Specifications		
	Excitation voltage	8 ... 36 V DC
	Excitation current	15 mA typical at 24 V DC 30 mA typical at 12 V DC, 100 mA max.
	Measuring rate	0.5 kHz (asynchronous)
	Stability (temperature)	± 0,2° (-20 … +40 °C) ± 0,4° (-40 … +85 °C)
	Repeatability	1 LSB
	Operating temperature	-40 … +85 °C
	Protection	Reverse polarity, short circuit
	EMV	DIN EN 61326-1:2013

Signal wiring
Connector M12, 5 pin



View to the sensor connector

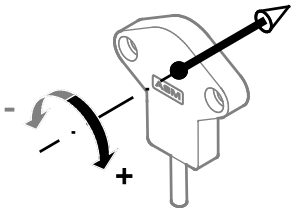
Output signals	Connector pin no.
Shield	1
Excitation +	2
GND	3
CAN-H	4
CAN-L	5

PTM29 - Characteristic of the linear output and axis orientation

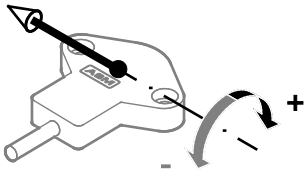
Sensor position as shown equals 0°.

1 Measuring axis

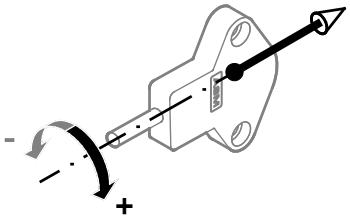
Axis orientation
1A



Axis orientation
1B

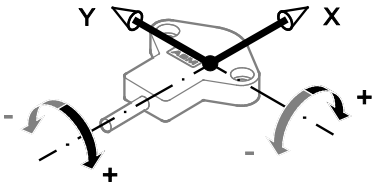


Axis orientation
1C

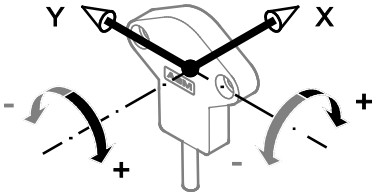


2 Measuring axes

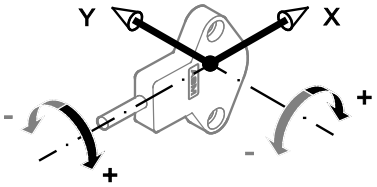
Axis orientation
2A



Axis orientation
2B



Axis orientation
2C



Output signal