Analog Inclination Sensor for 1 axis or 2 axes in MEMS technology

- Measurement range $\pm 180^\circ$ for 1 axis or $\pm 60^\circ$ for 2 axes
- Protection class IP67 / IP69K
- Analog output linear
- Aluminium or stainless steel housing
- Wear free, high resolution
- High shock resistance
- Servo flange mounting

Specifications

<table>
<thead>
<tr>
<th>Output</th>
<th>Voltage</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>U2</td>
<td>0.5 ... 10 V / $U_B = 18 \ldots 36$ V</td>
<td>5 pin connector M12 axial or radial</td>
</tr>
<tr>
<td>U8</td>
<td>0.5 ... 4.5 V / $U_B = 10 \ldots 36$ V</td>
<td></td>
</tr>
<tr>
<td>I1</td>
<td>Current 4 ... 20 mA / $U_B = 18 \ldots 36$ V</td>
<td></td>
</tr>
</tbody>
</table>

- Measurement range: $\pm 180^\circ$ for 1 axis or $\pm 60^\circ$ for 2 axes
- Resolution: 0.05°
- Linearity: $\pm 0.5^\circ$
- Settling time: 0.1 s ... 10 s / 90 %, configurable
- Protection class: IP67 / IP69K
- Material: Aluminium or stainless steel
- Shock (non-operational): EN 60068-2-27:1993, 100 g/11 ms, 100 shocks
- Vibration (non-operational): EN 60068-2-6:1995, 20 g/10 Hz-2 kHz, 10 cycles
- EMC, temperature: Refer to output specification

Order code PTAM2

Model name

Axis of inclination
1 = Inclination with regard to X axis (mounting X) $< 180^\circ$
2 = Inclination with regard to X and Y axis (mounting XY) $< 60^\circ$

Measuring range [in °]
15 ... 180 = $\pm 15^\circ$ ... $\pm 180^\circ$ in 15° increments

Output
U2 = 0.5 ... 10 V
U8 = 0.5 ... 4.5 V
I1 = 4 ... 20 mA

Characteristic
CW = Increasing signal for CW inclination
CCW = Increasing signal for CCW inclination
Output delay 0 ... 90 %
Tx.x = 0.1 s ... 10 s

Connection
M12R5 = 5 pin socket M12, radial (compatible with 4 pin mating connector)
M12A5 = 5 pin socket M12, axial (compatible with 4 pin mating connector)

Order code connector cable

Order example: PTAM2 - 1 - 180 - I1 - CW - T1.0 - M12R5
POSITILT®
PTDM2
Robust Inclination Sensor with CANopen Output

Digital Inclination Sensor with 1 or 2 axes
in MEMS technology
● Measurement range ±180° for 1 axis or ±60° for 2 axes
● Protection class IP67 / IP69K
● CANopen output
● Aluminium or stainless steel housing
● Wear free, high resolution
● High shock resistance
● Servo flange mounting

Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>CANopen (profile „Inclination Sensor“)</td>
</tr>
<tr>
<td>Measurement range</td>
<td>±180° for 1 axis or ±60° for 2 axes</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.05 °</td>
</tr>
<tr>
<td>Linearity</td>
<td>±0.5°</td>
</tr>
<tr>
<td>Settling time</td>
<td>0.1 s ... 10 s / 90%, configurable</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP67 / IP69K</td>
</tr>
<tr>
<td>Material</td>
<td>Aluminium or stainless steel</td>
</tr>
<tr>
<td>Connection</td>
<td>5 pin connector M12 axial or radial</td>
</tr>
<tr>
<td>Shock (non-operational)</td>
<td>EN 60068-2-27:1993, 100 g/11 ms, 100 shocks</td>
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<td>Vibration (non-operational)</td>
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</tr>
<tr>
<td>EMC, temperature</td>
<td>Refer to output specification</td>
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</tbody>
</table>

Bestellcode PTDM2

<table>
<thead>
<tr>
<th>Model name</th>
<th>Output</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTDM2</td>
<td>CANOP</td>
<td>5 pin socket M12, radial (compatible with 4 pin mating connector)</td>
</tr>
<tr>
<td></td>
<td>CANJ1939</td>
<td>5 pin socket M12, axial (compatible with 4 pin mating connector)</td>
</tr>
</tbody>
</table>

Order example: PTDM2 - CANOP - M12R5
POSITILT®
PTAM2/PTDM2
Inclination Sensor

Outline drawing
M12 radial

Outline drawing
M12 axial

Dimensions in mm  [inch]
Dimensions informative only.
For guaranteed dimensions consult factory.
Orientation of the inclination axis

1 axis

2 axes
## POSITILT®
### PTAM
### Analog outputs U2, U6, U8 and I1

### U2
**Voltage Output**
0.5 ... 10 V

- **Excitation voltage**: 18 ... 36 V DC
- **Excitation current**: 12 mA typ., 16 mA max.
- **Output voltage**: 0.5 ... 10 V DC
- **Output current**: 2 mA max.
- **Measuring rate**: 1 kHz standard
- **Stability (temperature)**: \( \pm 100 \times 10^{-6} / ^\circ C \) f.s. (typ.)
- **Operating temperature**: -40 ... +85 °C
- **Protection**: Reverse polarity, short circuit
- **EMC**: EN61326-1:2006

### U6
**Voltage Output**
0.5 ... 4.5 V DC

- **Excitation voltage**: 5V DC ±10 %
- **Excitation current**: 16 mA typ., 20 mA max.
- **Output voltage**: 0.5 ... 4.5 V DC
- **Output current**: 2 mA max.
- **Measuring rate**: 1 kHz standard
- **Stability (temperature)**: \( \pm 100 \times 10^{-6} / ^\circ C \) f.s. (typ.)
- **Operating temperature**: -40 ... +85 °C
- **Protection**: Reverse polarity, short circuit
- **EMC**: EN61326-1:2006

### U8
**Voltage output**
0.5 ... 4.5 V

- **Excitation voltage**: 10 ... 36 V DC
- **Excitation current**: 12 mA typ., 16 mA max.
- **Output voltage**: 0.5 ... 4.5 V DC
- **Output current**: 2 mA max.
- **Measuring rate**: 1 kHz standard
- **Stability (temperature)**: \( \pm 100 \times 10^{-6} / ^\circ C \) f.s. (typ.)
- **Operating temperature**: -40 ... +85 °C
- **Protection**: Reverse polarity, short circuit
- **EMC**: EN61326-1:2006

### I1
**Current Output**
4 ... 20 mA

- **Excitation voltage**: 18 ... 36 V DC
- **Excitation current**: 32 mA typ., 36 mA max.
- **Load resistor**: 500 Ω max.
- **Output current**: 4 ... 20 mA
- **Measuring rate**: 1 kHz standard
- **Stability (temperature)**: \( \pm 100 \times 10^{-6} / ^\circ C \) f.s. (typ.)
- **Operating temperature**: -40 ... +85 °C
- **Protection**: Reverse polarity, short circuit
- **EMC**: EN61326-1:2006

Other outputs available on request.
Output signals

<table>
<thead>
<tr>
<th>Signal Wiring</th>
<th>Output signals</th>
<th>Connector pin</th>
<th>Cable color</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Excitation +</td>
<td>1</td>
<td>brown</td>
</tr>
<tr>
<td></td>
<td>Output X</td>
<td>2</td>
<td>white</td>
</tr>
<tr>
<td></td>
<td>GND</td>
<td>3</td>
<td>blue</td>
</tr>
<tr>
<td></td>
<td>Output Y</td>
<td>4</td>
<td>black</td>
</tr>
<tr>
<td></td>
<td>Do not connect!</td>
<td>5</td>
<td>gray</td>
</tr>
</tbody>
</table>

Connection

M12A5 / M12R5
Inclination sensor with CANopen interface according to CiA 410.

### CANopen Interface

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication profile</td>
<td>CANopen CiA 301 V 4.02, Slave</td>
</tr>
<tr>
<td>Device profile</td>
<td>Encoder CiA 410 V 1.2</td>
</tr>
<tr>
<td>Configuration services</td>
<td>LSS, CiA Draft Standard 305 (transmission rate, node ID)</td>
</tr>
<tr>
<td>Error Control</td>
<td>Node Guarding, Heartbeat, Emergency Message</td>
</tr>
<tr>
<td>Node ID</td>
<td>Adjustable via LSS or via object dictionary, default: 127</td>
</tr>
<tr>
<td>PDO</td>
<td>1 TxPDO, 0 RxPDO, static mapping</td>
</tr>
<tr>
<td>PDO Modes</td>
<td>Event-/Time triggered, Remote-request, Sync</td>
</tr>
<tr>
<td></td>
<td>cyclic/acyclic</td>
</tr>
<tr>
<td>SDO</td>
<td>1 Server, 0 Client</td>
</tr>
<tr>
<td>Certified</td>
<td>Yes</td>
</tr>
<tr>
<td>Transmission rate</td>
<td>50 kbps to 1 Mbps, adjustable via LSS or via object dictionary, default: 125 kbps</td>
</tr>
<tr>
<td>Bus connection</td>
<td>M12 connector, 5 pin</td>
</tr>
<tr>
<td>Integrated bus terminating resistor</td>
<td>optional</td>
</tr>
<tr>
<td>Bus, galvanic isolation</td>
<td>No</td>
</tr>
</tbody>
</table>

### Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excitation voltage</td>
<td>11 ... 36 V DC</td>
</tr>
<tr>
<td>Excitation current</td>
<td>16 mA typical, 50 mA max.</td>
</tr>
<tr>
<td>Measuring rate</td>
<td>1 kHz standard</td>
</tr>
<tr>
<td>Stability (temperature)</td>
<td>±100 x 10^-6 / °C f.s.</td>
</tr>
<tr>
<td>Repeatability</td>
<td>1 LSB</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-40 ... +85 °C</td>
</tr>
<tr>
<td>Protection</td>
<td>Reverse polarity, short circuit</td>
</tr>
<tr>
<td>EMC</td>
<td>EN61326-1:2006</td>
</tr>
</tbody>
</table>
POSITILT®
PTDM
Output CAN SAE J1939

Description

Interface J1939
- CAN specification: ISO 11898, Basic and Full CAN 2.0 B
- Communication profile: SAE J1939
- Baud Rate: 250 kBit/s
- Internal termination resistor: 120 Ω, configurable
- Address: Address claiming (ACL), default 251d or commanded address

NAME Fields
- Arbitrary address capable: 1
- Industry group: 0x0, Global
- System: 0x0, Non specific
- System instance: 0x0, Non specific
- Function: 0xFFh
- Function instance: 0x0, Non specific
- ECU instance: 0x0
- Manufacturer: 0xD6 (214d), Manufacturer ID
- Identity number: 0XXX, Serial number

Parameter Group Numbers (PGN)
- Configuration data: PGN 0x00EF00, Proprietary-A-Message (peer-to-peer)
- Process data: PGN FFnnh, Proprietary-B-Message (broadcast); xx (low byte) customer configurable

Specifications
- Excitation voltage: 11 ... 36 V DC
- Excitation current: 16 mA typical, 50 mA max.
- Measuring rate: 1 kHz standard
- Stability (temperature): ±100 x 10⁻⁶ / °C f.s.
- Repeatability: 1 LSB
- Operating temperature: -40 ... +85 °C
- Protection: Reverse polarity, short circuit
- EMC: EN61326-1:2006

Signal wiring / connection
- Shield: 1
- Excitation +: 2
- GND: 3
- CAN-H: 4
- CAN-L: 5

View to sensor connector

Excitation voltage 11 ... 36 V DC
Excitation current 16 mA typical, 50 mA max.
Measure rate 1 kHz standard
Stability (temperature) ±100 x 10⁻⁶ / °C f.s.
Repeatability 1 LSB
Operating temperature -40 ... +85 °C
Protection Reverse polarity, short circuit
EMC EN61326-1:2006
POSIROT® / POSITILT®

Accessories

Connector Cables

<table>
<thead>
<tr>
<th>Connector cable for POSIROT® angle sensors</th>
<th>Description</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 pins M12</td>
<td>Suitable for 5-pin sensor connectors M12A5 and M12R5</td>
<td>KAB - XM - M12/4F/G/LITZE</td>
</tr>
<tr>
<td>8 pins M12</td>
<td>Suitable for 5-pin sensor connectors M12A5 and M12R5</td>
<td>KAB - XM - M12/8F/G/LITZE</td>
</tr>
</tbody>
</table>

Signal wiring

<table>
<thead>
<tr>
<th>M12, 4 pin</th>
<th>Connector pin / cable color</th>
<th>Length in m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brown</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M12, 8 pin</th>
<th>Connector pin / cable color</th>
<th>Length in m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>White</td>
<td>2</td>
</tr>
</tbody>
</table>
**PRPT-BPL1**

(screw mounting)
For PRAS2, PRDS2, PRAS3, PRDS3, PTAM2

Dimensions in mm [inch]

In combination with the mounting clamps PRPT-BFS1 (3 x M2.5).

In combination with the mounting brackets PRPT-BFS2 (3 x M4).

Weight 30 g approx.
Dimensions informative only.
For guaranteed dimensions please consult factory.

**PRPT-BPL2**

(welding assembly)
For PRAS2, PRDS2, PRAS3, PRDS3, PTAM2

In combination with the mounting clamps PRPT-BFS1 (3 x M2.5).

In combination with the mounting brackets PRPT-BFS2 (3 x M4).