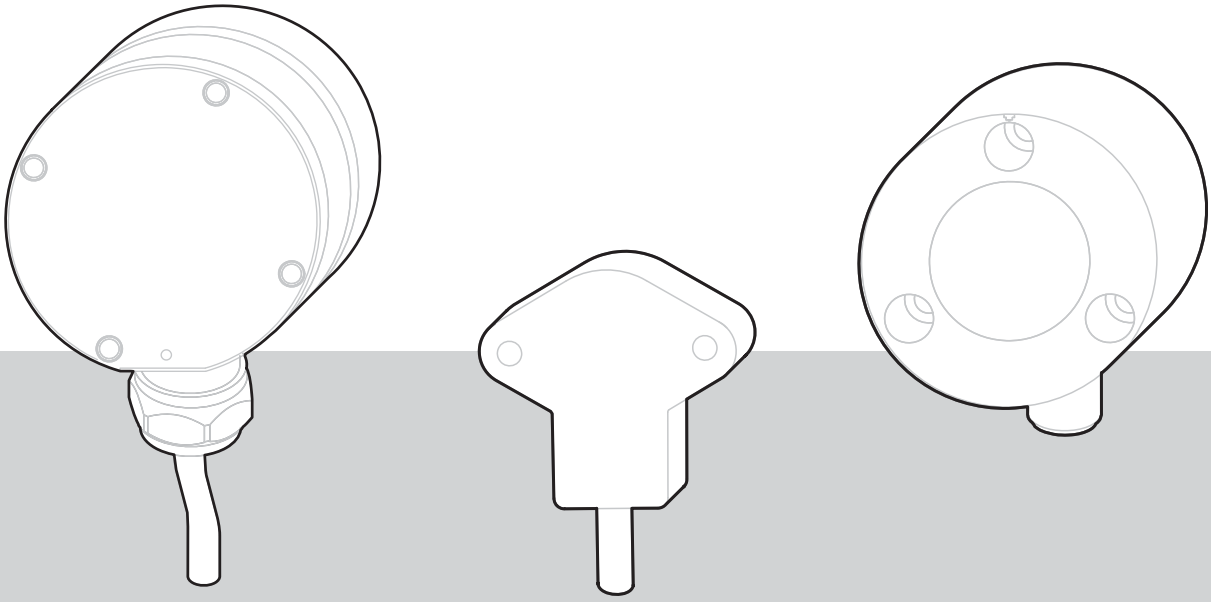
ASM®
perfect in sensors.

positilt® PTAM / PTDM

Inclination Sensors

Installation and operation manual **EN**



Please read carefully before installation and operation!

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Am Bleichbach 18 - 24
85452 Moosinning
Germany

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1 Safety instructions

1.1 Signal words and symbols



WARNING, Risk of Injury:
Indicates a potentially hazardous situation, which, if not avoided, can result in serious injury or property damage.

⚠ DANGER

WARNING, Risk of Personal Injury or Death:
Indicates a situation that can result in serious personal injury or death if not properly avoided.

⚠ WARNING

WARNING, Risk of Personal Injury or Death:
Indicates a situation that can result in moderate personal injury or death if not properly avoided.

⚠ CAUTION

WARNING, Risk of Personal Injury:
Indicates a situation that can result in minor personal injury if not properly avoided.

NOTICE

WARNING, Risk of Property Damage:
Indicates a situation that can result in minor to major property damage if not properly avoided.

Product liability

- Disregarding the following instructions may result in malfunction, damage to property and personal injury and releases the manufacturer from product liability.

Safety regulations

- National safety regulations must be observed!

1.2 General safety instructions

⚠ WARNING

Danger of injury to the operator or damage to the property

- Connection to power supply must be performed in accordance with safety instructions for electrical facilities and performed only by qualified personnel.
- Any alteration, reconstruction or extension of the sensor is not allowed!
  - The sensor must be operated only within values specified in the datasheet.
  - The danger of personal injury and danger of property damage due to a malfunction of the sensor in machines or systems must be excluded by additional safety measures.
  - In safety-relevant applications, additional facilities must be provided for maintaining safety and preventing damage.
  - Check whether the protection class of the sensor is suitable for the application.

NOTICE

Mechanical damage or destruction of the sensor

- Do not open the sensor.
- Avoid impact and shock to the sensor.

1.3 Intended use

positilt® inclination sensors of PTxM series measure inclination between ±15° and ±180° utilizing MEMS technology. For determining measuring range, environmental compatibility and connection data of the sensor, please note the data sheet. Use the sensor as intended by operating within its specified technical data and ambient conditions.

The installation and operating instructions supplied with the unit must be respected. All maintenance and service work must be carried out. The data sheet of the respective sensor is part of this instruction manual. If not yet available, it may be requested by stating the respective model number.

The sensor must not be improperly mounted, operated or serviced. In addition, operation of the sensor in faulty condition is prohibited.

2 Transport and storage

Observe storage and transport temperatures according to the temperatures specified in the data sheet.

Max. rel. humidity 60%, dew condensation must be prevented at all times.

The device must be secured against slipping and tipping during transport.

Shipment damage

Check sensor immediately for shipment damage. In case of any damage or equipment not operating appropriately, please contact your supplier.

Shipment content

- Sensor
- Installation and operation manual

3 Installation and initial operation

Functional description

Tilt sensors of the positilt® product family measure the angle of inclination for one or two axes. Measuring range can be specified from ±15 up to ±180 degree. Output configuration comprises voltage or current output and CAN interface. A wide variety of package and mounting options provide flexibility for many applications.

Zero position (optional)

The zero (center) position of the inclinometers positilt® can be configurated not only via the mechanical adjustment but also via a switching input (Teach-In) when the connector pin ZERO is connected to 0 V GND) for 2 seconds.

3.1 Mechanical installation

Torque for fixing screws

The specified torques and mounting methods are general recommendations and can differ according to application and operating conditions.

Model	Mounting method	Material	Torque [Nm]
PTAM27	Screws M4	-	<1
PTAM2 / PTDM2	Screws M2,5 for mounting brackets	-	0.8
PTAM4	Screws M6	A4	<4
PTAM5 / PTDM5	Screws M8	steel	<10
PTAM6 / PTDM6	Screws M6	steel	<6
PTAM7 / PTDM7	Screws M6	steel	<6

Mounting instructions for PTAM27/PTDM27

- Mount the sensor on a flat surface
- Do not deform the sensor housing!
- Lateral inclination sensitivity: up to 30° lateral inclination the resulting error is ≤1°

Mounting instructions for PTAM4

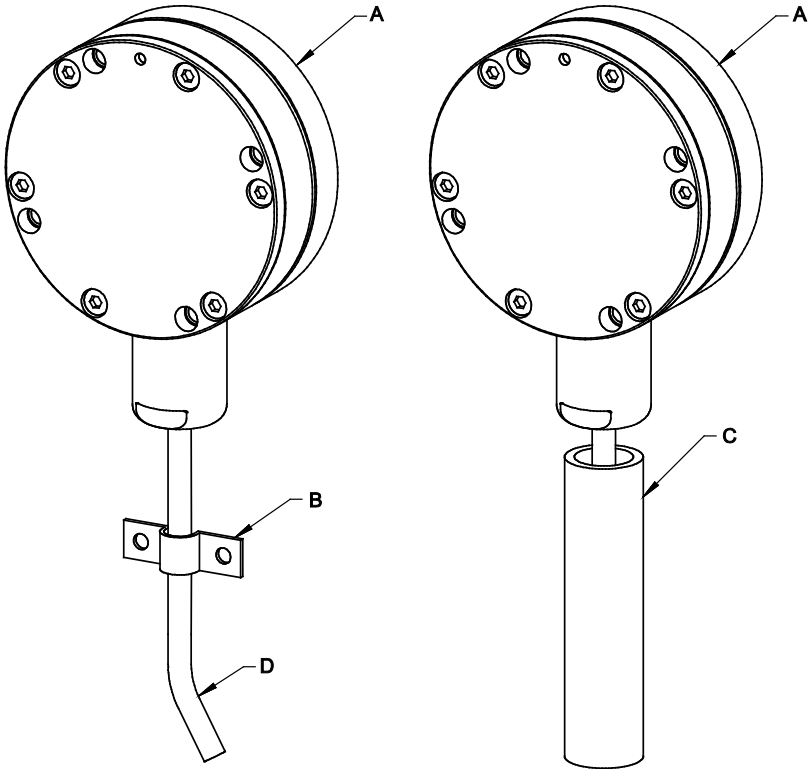
- Mount the sensor on a flat surface

NOTICE

Risk of damage to the sensor due to corrosion (PTAM4)

- Avoid or seal gaps of <0.5mm while mounting the sensor
- Use seawater-proof material
- Take suitable precautions against fouling
- Remove the contamination in case of fouling; define suitable maintenance intervals.

Installation of the sensor supply cable (underwater housing)

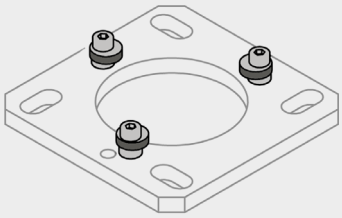
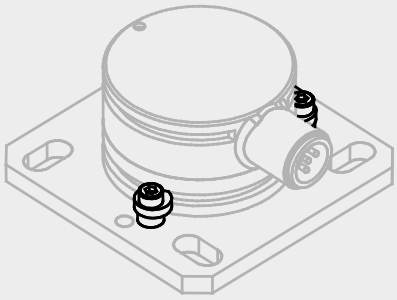
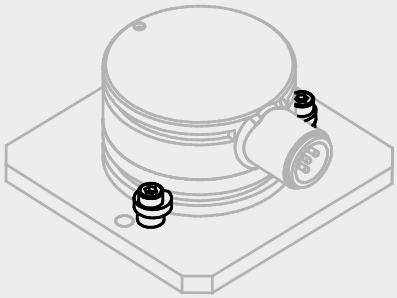


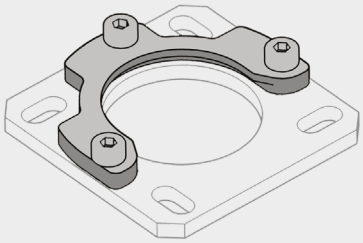
A – PTAM4
B – Strain relief with a separate cord grip
C – Mechanical protection

D – R>30 min. bending radius with fixed cable
R>30 min. bending radius with free cable

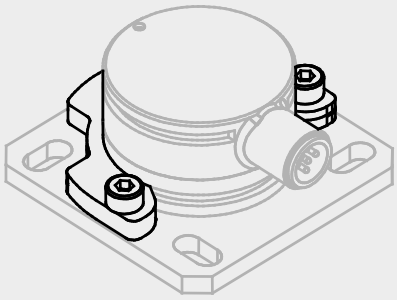
Lateral inclination sensitivity:
Up to 30° lateral inclination the resulting error is ≤1°.

Mounting possibilities PTxM2

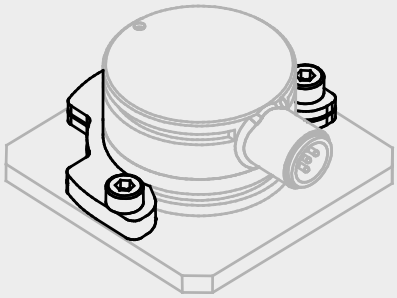
Mounting possibilities of PTxM2 sensors	
	**Mounting clamp BFS1**
	**PRPT-BPL1 + PRPT-BFS1** (Mounting plates for screw mounting + mounting clamp)
	**PRPT-BPL2 + PRPT-BFS1** (Mounting plates for welding assembly + mounting clamp)



Mounting clamp BFS2



PRPT-BPL1 + PRPT-BFS2
(Mounting plates for screw mounting + mounting clamp)



PRPT-BPL2 + PRPT-BFS2
(Mounting plates for welding assembly + mounting clamp)

3.2 Electrical connection

NOTICE

Damage or destruction of the sensor due to excessive operating voltage or mounting error

- The applied operating voltage must not exceed the value specified in the data sheet.
- Operate the sensor only within the limits specified in the data sheet.
- Connection to the power supply only by qualified personnel and in accordance with the applicable safety regulations for electrical equipment.
- Do not connect or disconnect the sensor under voltage!

Corrosion in the sensor due to moisture penetration

- Use the sensor only according to protection class.
- The mating connector should have the same protection class as the sensor, otherwise the lower IP rating of the mating connector is valid.
- Avoid crossing the dew point.
- Cable outputs must be installed in such a way that no moisture can get into the cable.
- The protection class of sensors with connector output is valid only if the electrical plug is connected!

Damage of the sensor cable due to mechanical stress

- Do not twist the M12 connector inserts.
- It is important that the knurled nuts on the connectors are tightened to the correct torque for each different size of the connector:
  - M12-ASM connectors / couplings: 1.0 Nm
  - connectors / couplings of other manufacturers: according to manufacturer instruction.
  - Use a torque wrench.
- Do not strain the connection cable.
- A separate strain relief is recommended.

Damage to the sensor via water ingress through the junction box due to corrosion resulting from water penetration (PTAM4)

- The connecting cable must be routed to the terminal box via a pressure-tight cable gland.

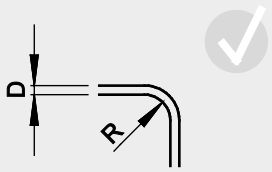
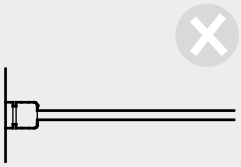
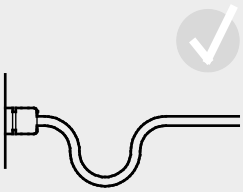
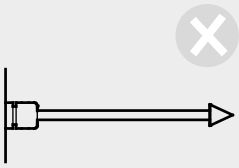
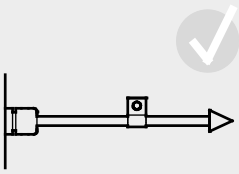
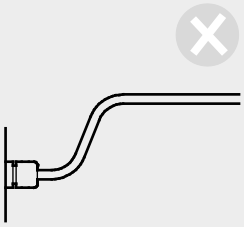
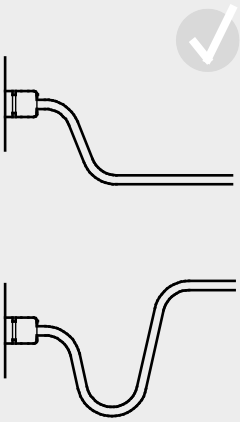
Connector Pin assignment

According to the definitions of the output types contained in the appendix. Observe different color code for pre-assembled accessory cables. See catalog information for accessories.

Supply voltage

See specification in the data sheet of the sensor. The maximum operating voltage must not be exceeded.

Installation of the sensor supply cable

	incorrect	correct
Admissible bending radius of the cable must be observed: R ~ 5 x D R ~ 10 x D (underwater cable)		
Length compensation for the cable must be observed		
A separate cord grip for cable strain relief is recommended		
Observe cable routing in case of splashing water, water condensation and humidity		

Electromagnetic Compatibility (EMC)

Electromagnetic compatibility of positilt® inclination sensors is influenced by the sensor wiring.

NOTICE

Possible malfunction of the sensor when used in systems with highly interference-prone components such as frequency inverters

Recommended wiring:

- Use single shielded sensor cable with twisted pair conductors for power supply and signal output.
- Connect the cable shield to ground on one side of the control cabinet. Connect the shield connection over a large area using cable clamps before or at the cable entry into the control cabinet. When preassembled cables are delivered, the screen is not connected to the housing on the sensor side.
- Do not install sensor cables close to power conductors such as motor or contactor control cables (use separate cable ducts for signal and power cables).
- Install the cables in metal cable ducts which are connected to ground.

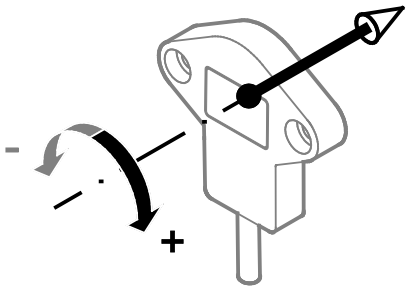
3.3 Operating temperature

positilt® PTAM27 / PTDM27	-40 … +85°C
positilt® PTAM2 / PTDM2	-40 … +85°C
positilt® PTAM4	-20 ... +85°C (up to +30°C in sea water)
positilt® PTAM5 / PTDM5	-40 … +85°C
positilt® PTAM6 / PTDM6	-40 … +85°C
positilt® PTAM7 / PTDM7	-40 … +85°C

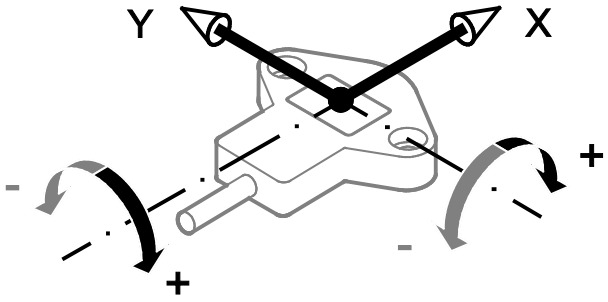
3.4 Position of the inclination axis and characteristics of the linear output

Position of the inclination axis and characteristic of the linear output PTxM27

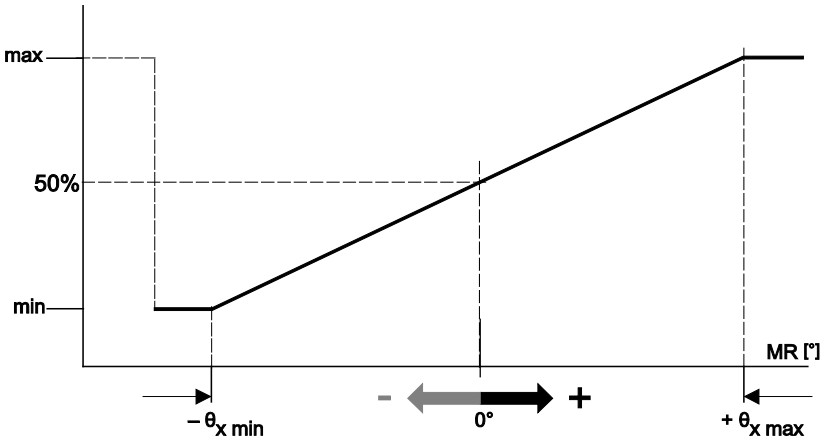
PTxM27
1 axis



PTxM27
2 axes

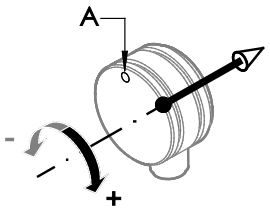


Output signal

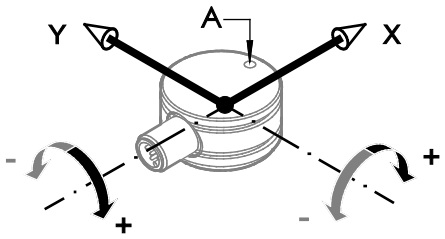


Position of the inclination axis and characteristic of the linear output PTxM2

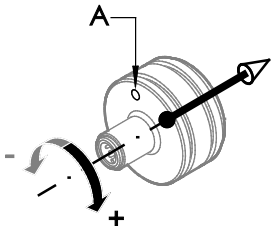
PTxM2 axial
Connector M12, 1 axis
A – Marking



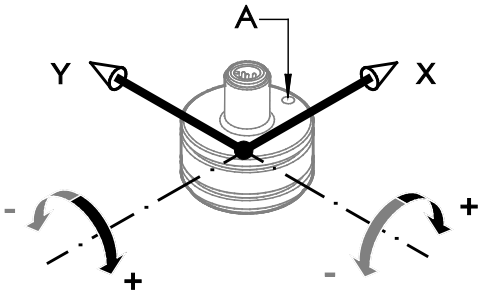
PTxM2 axial
Connector M12, 2 axes
A – Marking



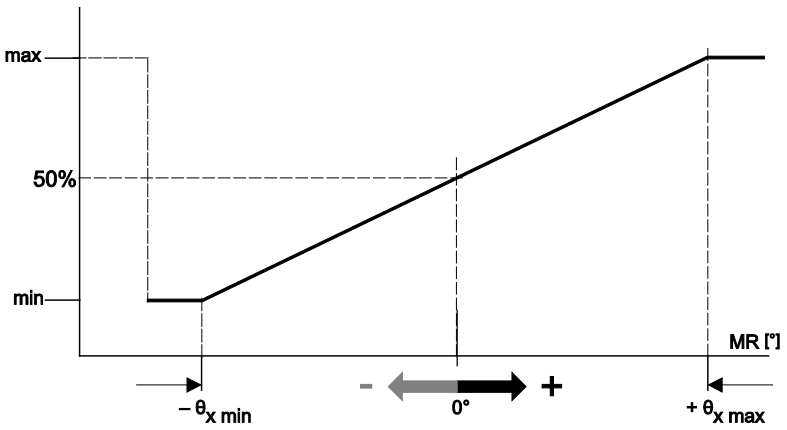
PTxM2 radial
Connector M12, 1 axis
A – Marking



PTxM2 radial
Connector M12, 2 axes
A – Marking

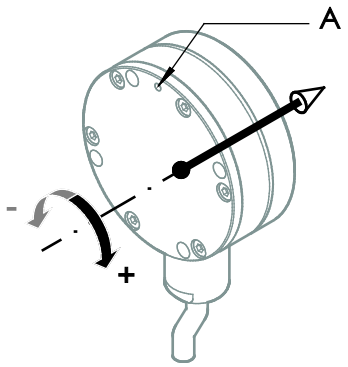


Output signal

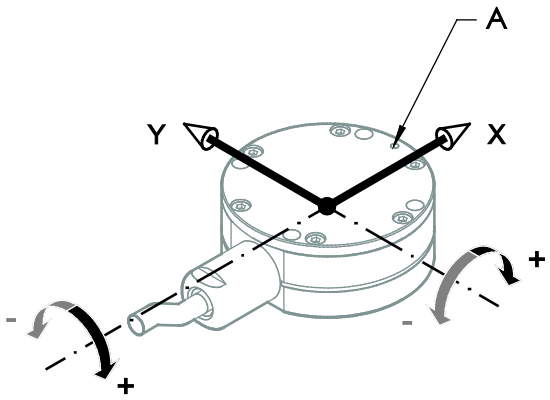


Position of the inclination axis and characteristic of the linear output PTAM4
Sensor position as shown equals 0°.

PTAM4
1 axis

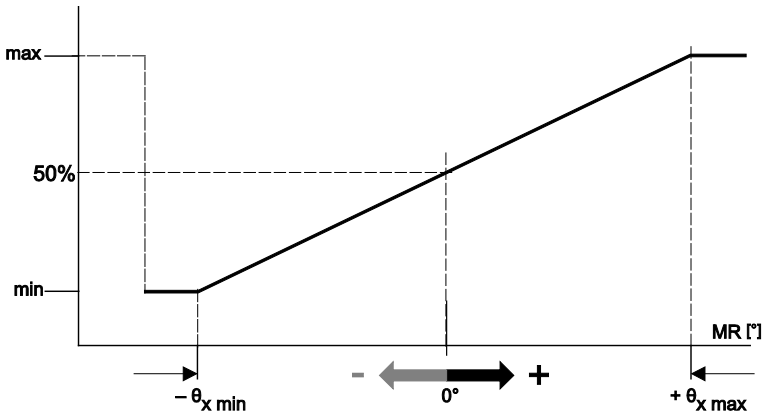


PTAM4
2 axes



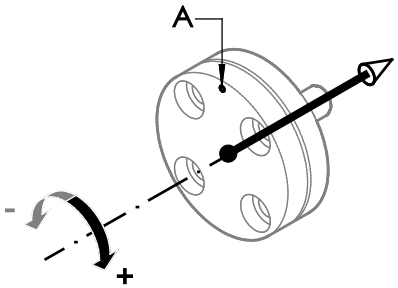
A: Marking

Output signal

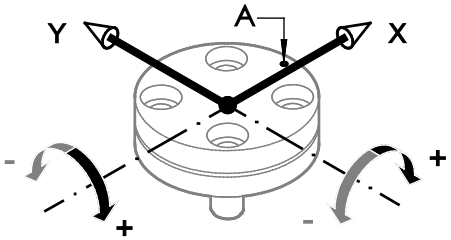


Position of the inclination axis and characteristic of the linear output PTxM5

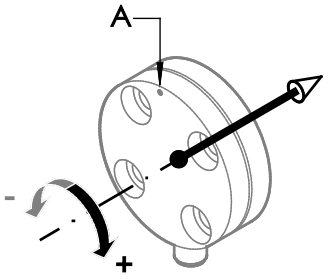
PTxM5 axial
Connector M12, 1 axis



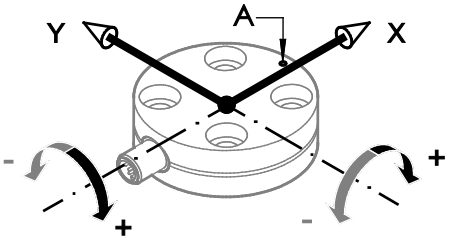
PTxM5 axial
Connector M12, 2 axes



PTxM5 radial
Connector M12, 1axis

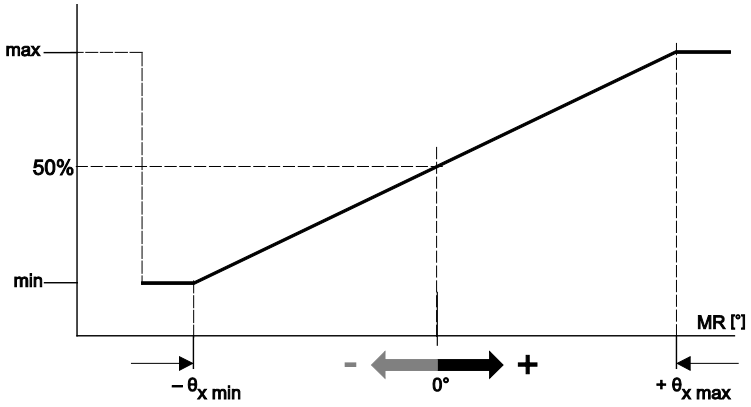


PTxM5 radial
Connector M12, 2 axes



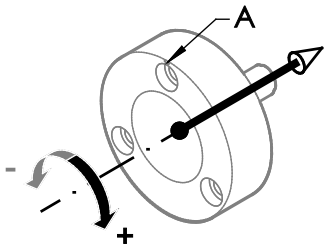
A – Marking

Output signal

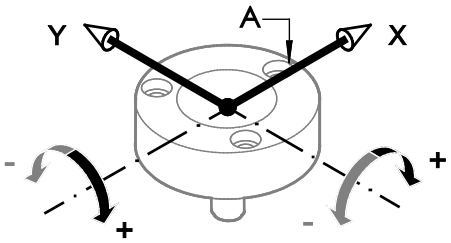


Position of the inclination axis and characteristic of the linear output PTxM6

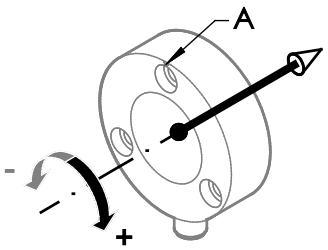
PTxM6 axial
Connector M12, 1 axis



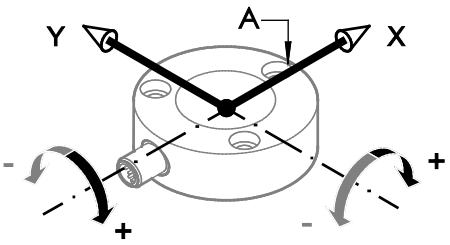
PTxM6 axial
Connector M12, 2 axes



PTxM6 radial
Connector M12, 1 axis

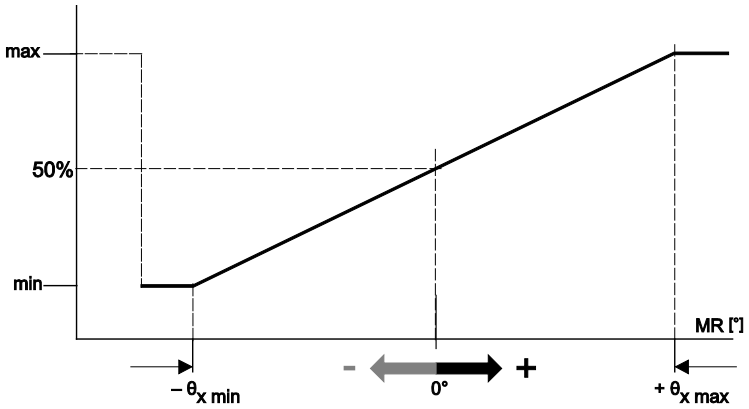


PTxM6 radial
Connector M12, 2 axes



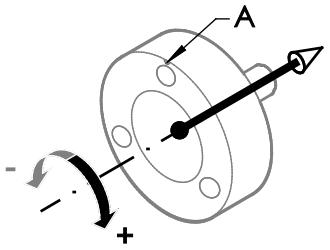
A – Marking

Output signal

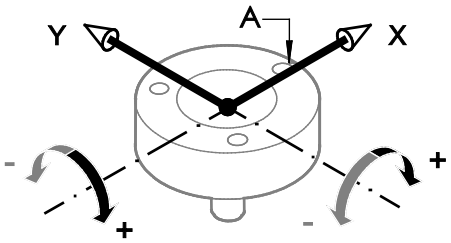


Position of the inclination axis and characteristic of the linear output PTxM7

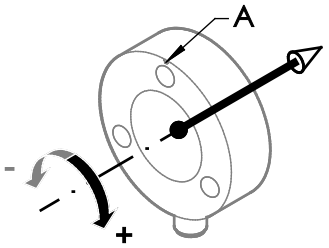
PTxM7 axial
Connector M12, 1 axis



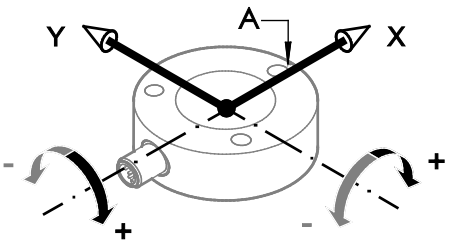
PTxM7 axial
Connector M12, 2 axes



PTxM7 radial
Connector M12, 1 axis

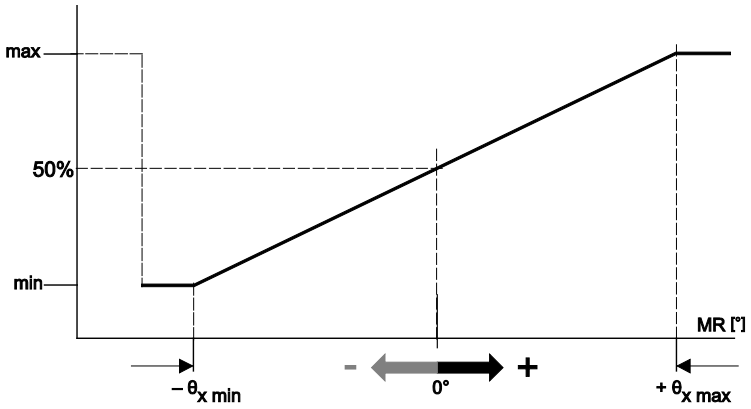


PTxM7 radial
Connector M12, 2 axes



A – Marking

Output signal



4 Maintenance and disposal

4.1 Maintenance and repair

NOTICE

Opening all positilt® sensors will cause damage and void the warranty

- Do not open the sensor.
- Due to possible risk of injury by improper handling, we strongly advise against repair attempts. No warranty or liability will be granted for opened sensors.

Maintenance interval

Proper maintenance comprises the visual examination of parts (e.g. integrity of housing, connectors and cables). Maintenance intervals depend on the specific application and should be defined by the user in dependence of operating conditions. Damaged sensors must be shut down immediately and sent to the factory for repair.

Check sensor regularly for possible damage. The following maintenance steps are recommended:

Inspection of …	Measures
Integrity of housing, connector	Damaged parts: Put sensor out of service and replace damaged parts resp. send sensor to ASM for repair
Mounting elements	Loose mounting parts: Screw tight mounting parts with recommended torque, if applicable use bolt adhesive
Fouling check	Remove fouling

4.2 Disposal

Disposal according to applicable government regulations.

5 Output specification

5.1 Analog output

NOTICE The output signals of sensors with 2 analog outputs mustn't be connected to one another!

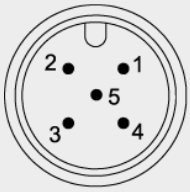
U2 Voltage output 0.5 ... 10 V 	Excitation voltage	18 … 36 V DC
	Excitation current	typical 12 mA max. 16 mA
	Output voltage	0.5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±100 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

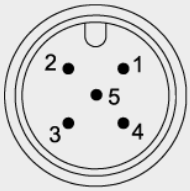
U6 Voltage output 0.5 … 4.5 V 	Excitation voltage	5 V DC ±10 %
	Excitation current	typical 13 mA max. 16 mA
	Output voltage	10 … 90 % of the excitation voltage
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±100 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

U8 Voltage output 0.5 … 4,5 V 	Excitation voltage	18 … 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)	±100 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	18 … 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)	±100 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

Analog output (connector output)

Signal wiring **1 axis** **Connector M12, 5 pin**	**Signal**	**Connector pin no.**
 View to the sensor connector	+U_B (excitation voltage)	1
	Analog output X axis	2
	GND	3
	Do not connect!	4
	Do not connect!	5

2 axes **Connector M12, 5 pin**	**Signal**	**Connector pin no.**
 View to the sensor connector	+U_B (excitation voltage)	1
	Analog output X axis	2
	GND	3
	Analog output Y axis	4
	Do not connect!	5

Analog output (cable output, except seawater resistant submarine cable)

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

2 axes	**Output signals**	**Cable color**
	+U_B (excitation voltage)	brown
	Analog output X axis	white
	GND	blue
	Analog output Y axis	black
	Do not connect!	grey

Analog output (cable output, seawater resistant submarine cable)

Signal wiring 1 axis	**Output signals**	**Cable color**
	$+U_V$ (Excitation)	white
	Analog output X axis	green
	GND	brown
	Do not connect!	grey

2-achsig	**Output signals**	**Cable color**
	$+U_V$ (Excitation)	white
	Analog output X axis	green
	GND	brown
	Analog output Y axis	yellow
	Do not connect!	grey

Analog output, tare function

U2/PMZ Voltage output 0.5 ... 10 V 	Excitation voltage	18 … 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)	±100 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

U6/PMZ Voltage output 0.5 … 4.5 V 	Excitation volta5ge	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)	±100 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

U8/PMZ Voltage output 0.5 … 4,5 V 	Excitation voltage	18 … 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)	±100 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

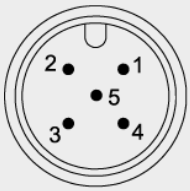
I1/PMZ Current output 4 … 20 mA, 3 wires 	Excitation voltage	18 … 36 V DC
	Excitation current	typical 32 mA max. 36 mA
	Load R_L	500 Ω max.
	Output current	4 … 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	±100 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 … +85 °C
	EMC	DIN EN 61326-1:2013

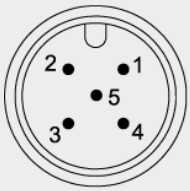
Tare function ZERO (PMZ)

Programming the zero point by the customer:

The tare function “ZERO“ allows to program the zero point of the output range by using a signal ZERO available at the connector. This Signal ZERO must be connected with GND via a push button. At first the sensor must be brought into the zero position. Pushing the button for 2 seconds sets the actual position as the zero point. The values are available as well after switching off the sensor.

Analog output, tare function (connector output)

Signal wiring 1 axis **Connector M12, 5 pin**	**Output signals**	**Connector pin no.**
 View to the sensor connector	$+U_B$ (excitation voltage)	1
	Analog output X axis	2
	GND	3
	Do not connect!	4
	ZERO	5

2 axes **Connector M12, 5 pin**	**Output signals**	**Connector pin no.**
 View to the sensor connector	$+U_B$ (excitation voltage)	1
	Analog output X axis	2
	GND	3
	Analog output Y axis	4
	ZERO	5

Analog output, tare function (cable output, except seawater resistant submarine cable)

Signal wiring	**Output signals**	**Cable color**
1 axis	Excitation voltage $+U_B$	brown
	Analog output X	white
	GND	blue
	Do not connect!	black
	ZERO	grey

2 axes	**Output signals**	**Cable color**
	Excitation voltage $+U_B$	brown
	Analog output X	white
	GND	blue
	Analog output Y	black
	ZERO	grey

Analog output, tare function (cable output, seawater resistant submarine cable)

Signal wiring 1 axis	**Output signals**	**Cable color**
	$+U_V$ (Excitation)	white
	Analog output X axis	green
	GND	brown
	ZERO (Option)	grey

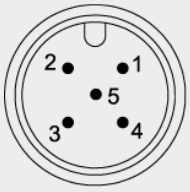
2 axes	**Output signals**	**Cable color**
	$+U_V$ (Excitation)	white
	Analog output X axis	green
	GND	brown
	Analog output Y axis	yellow

5.2 Digital output

CANOP CANopen 	Communication profile	CANopen CiA 301 V 4.02, Slave
	Encoder profile	CiA 410 V 1.2, 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	50 kBit … 1 Mbit, adjustable via LSS or SDO, default: 125 kBit
	Bus connection	M12 conncector, 5 pin
	Bus with integrated terminating resistance	optional
	Bus, galvanic isolated	no

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	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	DIN EN 61326-1:2013

Signal wiring **Connector M12, 5 pin**	**Output signals**	**Connector pin no.**
	Shield	1
	Excitation +	2
	GND	3
	CAN-H	4
	CAN-L	5



View to the sensor connector

Digital output CANopen (cable output, seawater resistant submarine cable)

Signal wiring	Output signals	Cable color
	$+U_V$ (Excitation voltage)	red
	GND	black
	CAN-H	blue
	CAN-L	white

CANopen – Set up (MCANOP)

WWW.

Download

- A detailed specification of this interface can be downloaded from the ASM website:

  www.asm-sensor.com/en/downloads.html > Configuration files

⚠ WARNING

Risk of injury by unexpected machine movement

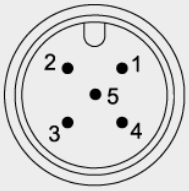
- Change parameters only when machine is in a safe condition!
- Changing parameters may cause unexpected machine movement.
- Changing parameters may influence dependent parameters e.g. changing the resolution may have influence on position of CAM switches.
- Precautions have to be taken to avoid damage to human and machine parts!

CANJ1939 SAE J1939 	CAN specification	ISO 11898, Basic and Full CAN 2.0 B	
	Transceiver	24V-compliant, not isolated	
	Communication profile	SAE J1939	
	Transmission rate	250 kbit/s	
	Address	Default 247d, configurable	

NAME Fields	Arbitrary address capable	1	Yes
	Industry group	0	Global
	Vehicle system	7Fh (127d)	Non specific
	Vehicle system instance	0	
	Function	FFh (255d)	Non specific
	Function instance	0	
	ECU instance	0	
	Manufacturer	145h (325d)	Manufacturer ID
	Identity number	0nnn	Serial number 21 bit

Parameter Group Numbers (PGN)	Configuration data	PGN EF00h	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	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
	EMV	DIN EN 61326-1:2013

Signal wiring	Output signals	Connector pin no.
Connector M12, 5 pin	Shield	1
 View to the sensor connector	Excitation +	2
	GND	3
	CAN-H	4
	CAN-L	5

Digital output CANJ1939 (cable output, seawater resistant submarine cable)

Signal wiring	Output signals	Cable color
	$+U_V$ (Excitation voltage)	red
	GND	black
	CAN-H	blue
	CAN-L	white

SAE J1939 – Set up (MCANJ1939)

WWW.

Download

- A detailed specification of this interface can be downloaded from the ASM website:

  www.asm-sensor.com/en/downloads.html > Configuration files

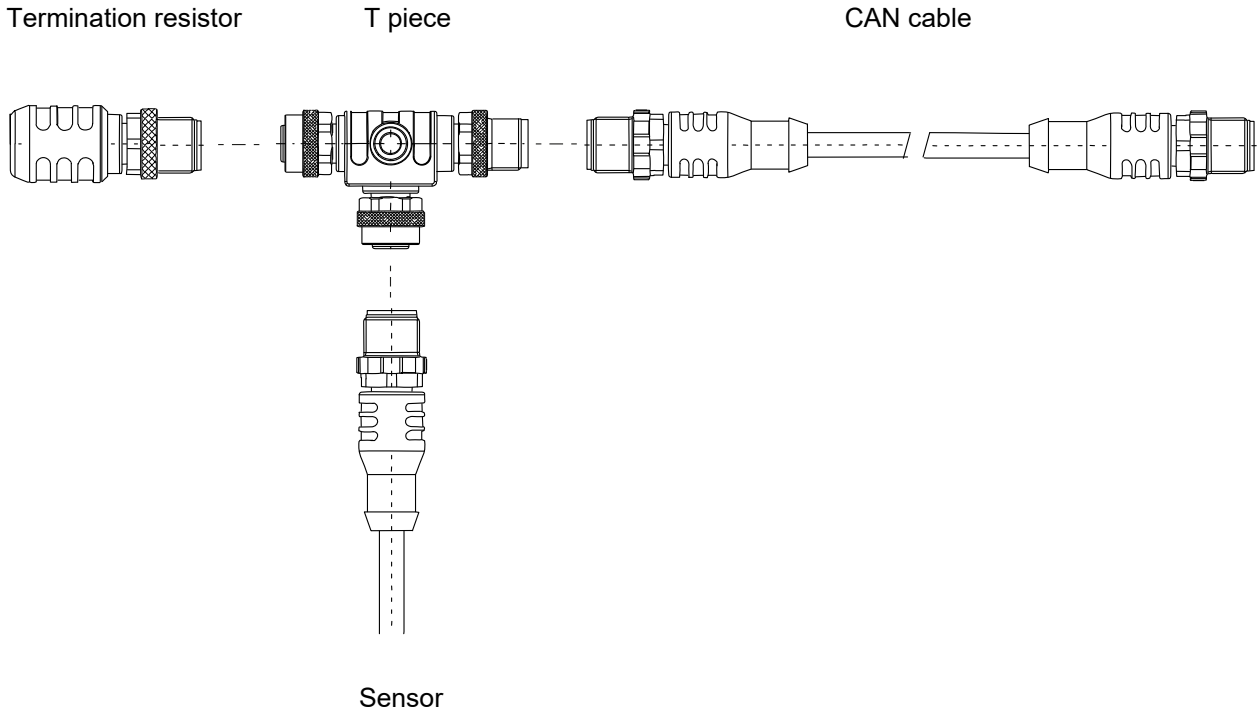
⚠ WARNING

Risk of injury due to unexpected machine movement

- Change parameters only when machine is in a safe condition!
- Changing parameters may cause unexpected machine movement.
- Changing parameters may influence dependent parameters e.g. changing the resolution may have influence on position of CAM switches.
- Precautions have to be taken to avoid damage to human and machine parts!

CAN-Bus wiring

Connect the device by a T-connector to the CAN trunk line. Total length of stubs should be minimized. Do not use single stub lines longer than 0.5 m. Connect terminating resistors 120 Ohm at both ends of the trunk line.



Reliability Parameters

Models	**PTAM27/PTDM27, PTAM2/PTDM2, PTAM4, PTAM5/PTDM5, PTAM6/PTDM6, PTAM7/PTDM7, PTM29**	
Interface	U2	Voltage interface 0,5 ... 10 V
	U6	Voltage interface 0,5 ... 4,5 V
	U8	Voltage interface 0,5 ... 4,5 V
	I1	Current interface 4 ... 20 mA
	U2/PMZ	Voltage interface 10 V, programmable
	U6/PMZ	Voltage interface 0,5 ... 4,5 V, programmable
	U8/PMZ	Voltage interface 0,5 ... 4,5 V, programmable
	I1/PMZ	Current interface 4 ... 20 mA, programmable
	MCANOPEN	CANopen interface
	MCANJ1939	SAE J1939 interface
Reliability Parameters	Probability of failure	1 x 10^{-6}/h
	Working life MTTF	110 years
	Service life	10 years
Standards	Failure rate of electronic components (Siemens)	SN29500

perfect in sensors.

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ASM Automation Sensorik Messtechnik GmbH
Am Bleichbach 18 - 24
85452 Moosinning
Germany
Tel. +49 8123 986-0
Fax +49 8123 986-500
info@asm-sensor.com

ASM Sensors, Inc.
650 W. Grand Ave., Unit 205
Elmhurst, IL 60126
USA
Tel. +1 630 832-3202
Fax +1 630 832-3204
info@asmsensors.com

ASM Sales Office UK
Tanyard House, High Street
Measham, Derbs DE12 7HR
United Kingdom
Tel. +44 845 1222-123
Fax +44 845 1222-124
info@asm-sensor.com

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