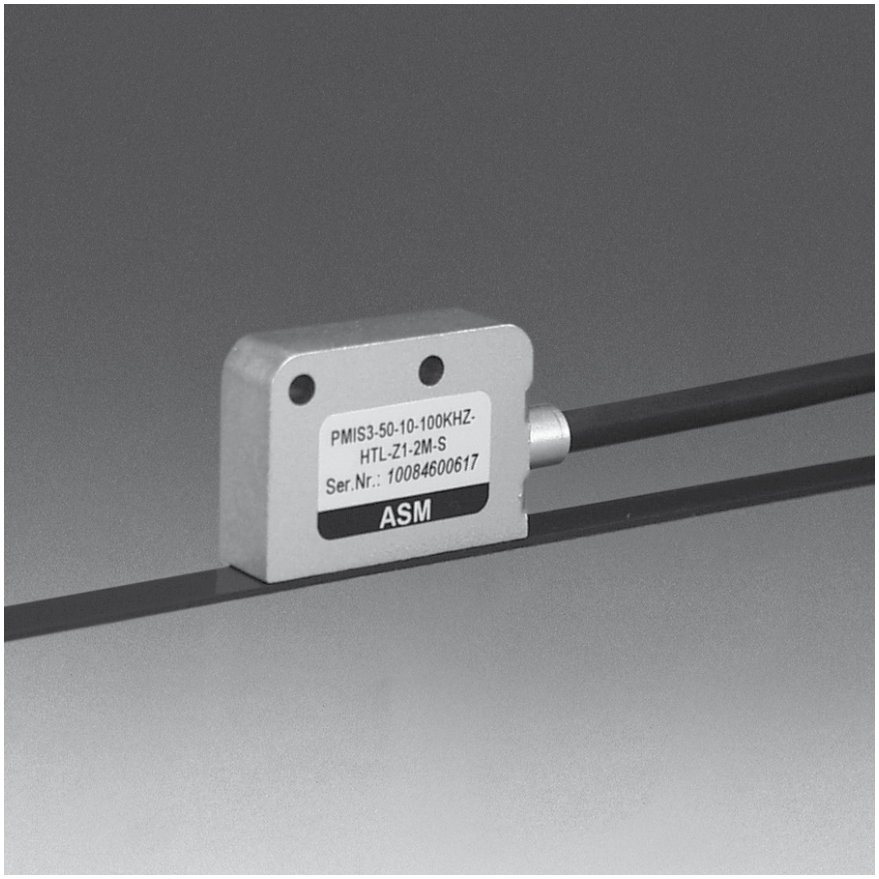
POSIMAG® - PMIS3 / PMIS4

Magnetic Scale Position Sensors

Instruction Manual



Please read carefully before installation and operation!

Contents

Safety instructions

DANGER

Do not use POSIMAG® position sensors in safety critical applications where malfunction or total failure of the sensor may cause danger for man or machine.

For safety related applications additional mechanisms (devices) are necessary to maintain safety and to avoid damage.

Disregard of this advice releases the manufacturer from product liability.

The sensor must be operated only within values specified in the catalog or datasheet.

Connection to power supply must be performed in accordance with safety instructions for electrical facilities and performed only by trained staff.

Do not connect or disconnect the sensor under tension!

Explanation of used safety signs and signal words

	**WARNING, Risk of Injury:** **Indicates a potentially hazardous situation, which, if not avoided, could 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.**

POSIMAG®
Instruction Manual

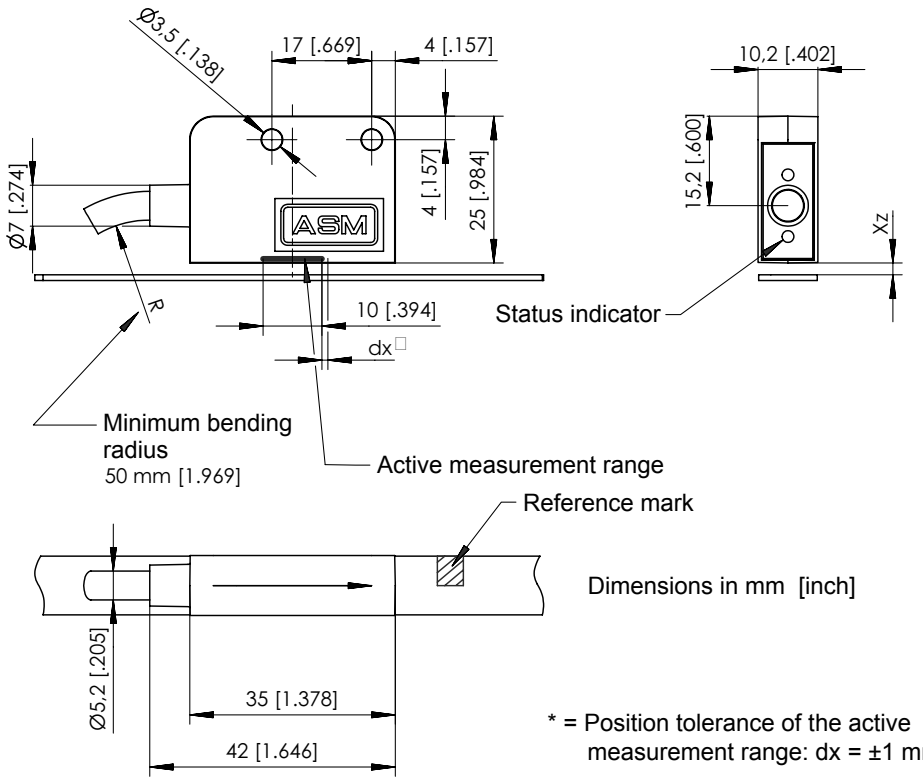
Description

The sensor head

all options. The first option after the model type is the magnetic period (example: PMIS3 - 50 - 25 - 50KHZ - HTL - Z0 - 2M - S; in that case the magnetic period is 5 mm). The orientation of the sensor head related to the magnetic strip must be observed (see mounting of the sensor head).

We recommend a quadrature counter (e.g. Agilent HCTL2000) for the exact evaluation of incremental signals. An edge-sensitive up/down counter is not suitable.

PMIS3 & PMIB3



Bending radius
(see page 5)

The magnetic strip / magnetic wheel

The first option of model name of the magnetic strip is also the magnetic period. Important: the magnetic period of the sensor head and the magnetic strip must be the same!

The magnetic strip should extend the measuring range by approx. 20-25mm at each end. A non-magnetic masking tape made of stainless steel is available as an accessory.

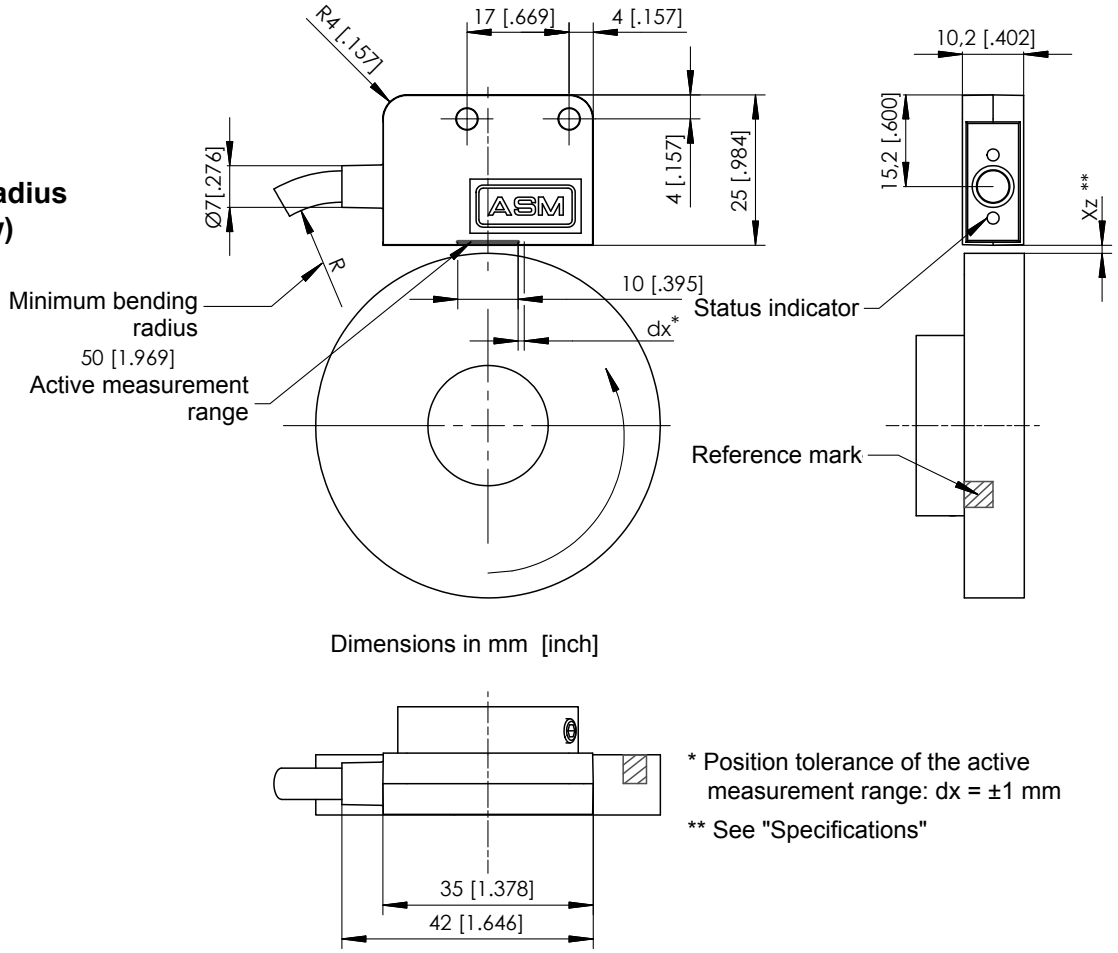
Chemical durability

Resistant against mineral oil, vegetable oil and methane alcohol.
Not resistant against solvents and acids.
Danger of corrosion in sea water.

POSIMAG®
Instruction Manual

PMIS4 & PMIR7N
PMIS4 & PMIR4

Bending radius (see below)



Dimensions in mm [inch]

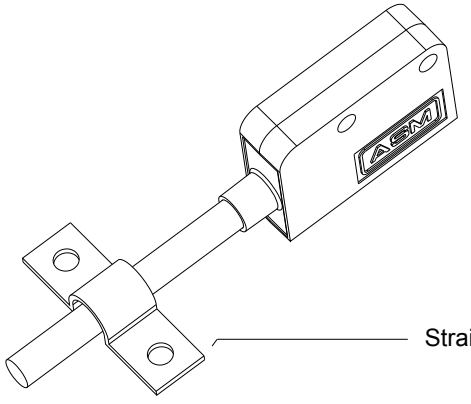
* Position tolerance of the active measurement range: dx = ±1 mm

** See "Specifications"

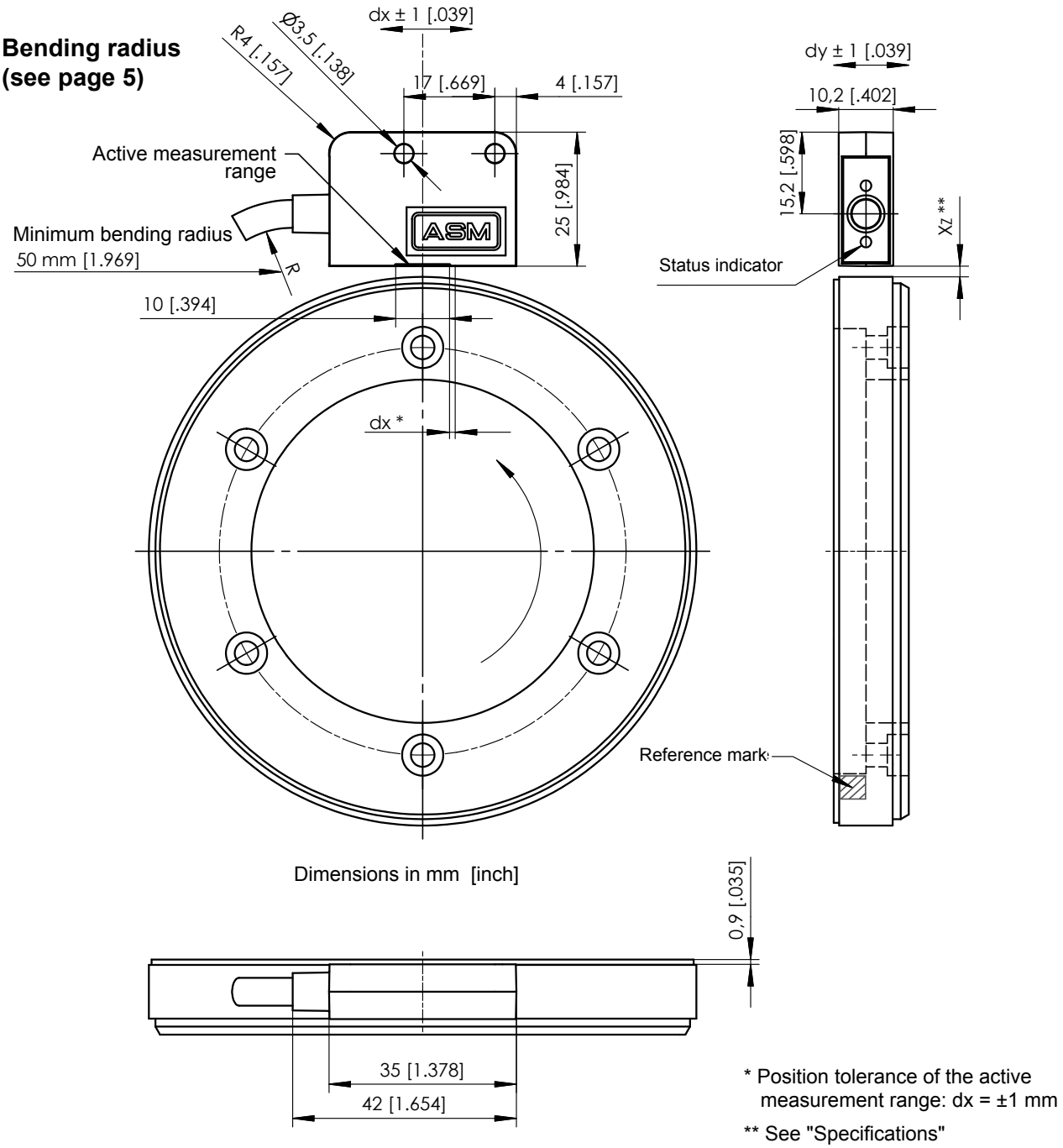
Cable mounting and bending radius

For all sensors with cable:

Cable diameter	Ø 5,2 mm	
Min. bending radius	in motion	not in motion
	10 x Ø, 10 million cycles	5 x Ø



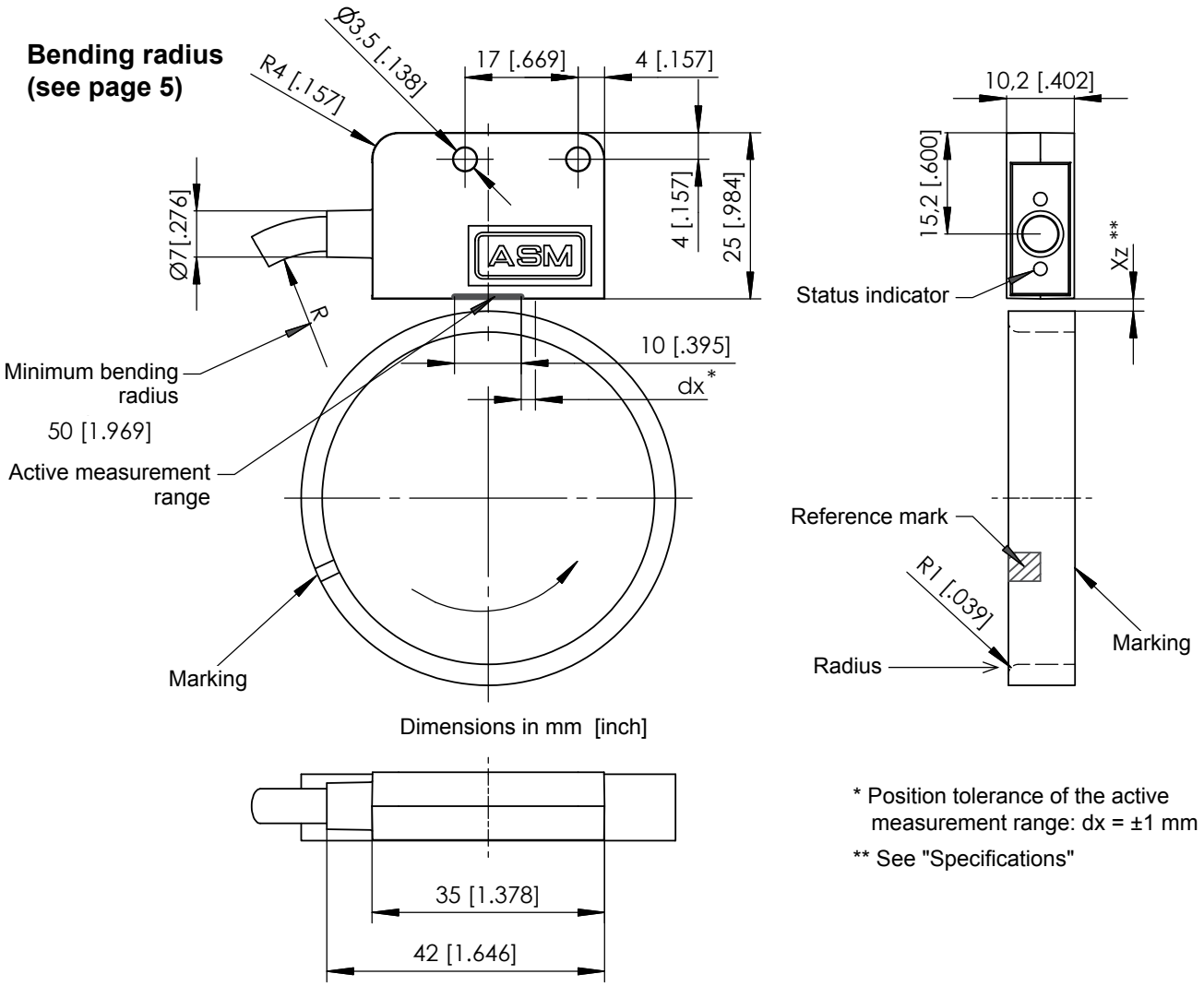
PMIS4 & PMIR5



* Position tolerance of the active measurement range: dx = ±1 mm

** See "Specifications"

PMIS4 & PMIR7



* Position tolerance of the active measurement range: dx = ±1 mm

** See "Specifications"

POSIMAG®
Instruction Manual

Masking tape PMAB:

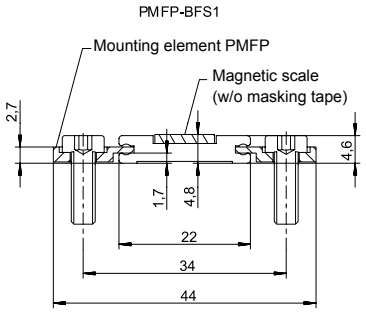
Masking tape made of stainless steel for POSIMAG® magnetic scale PMIB3, width 10 mm, thickness 0.2 mm

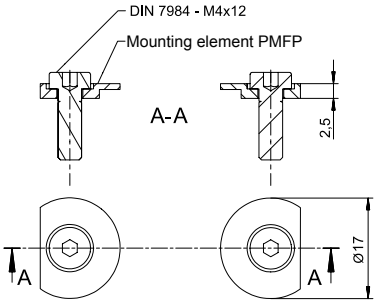
PMAB — 10MM — □

Order code:

Length in mm

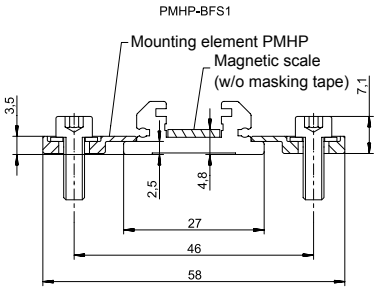
Outline drawing flat profile PMFP

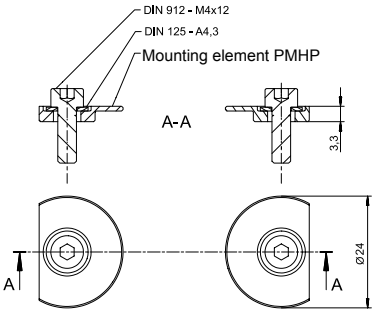




Mounting set PMFP-BFS1

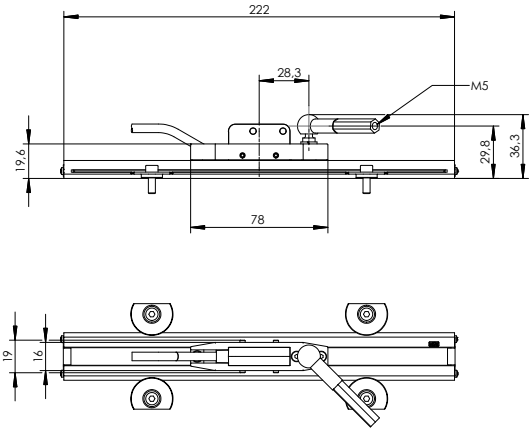
Outline drawing high profile PMHP

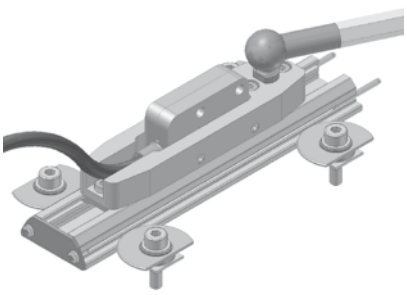




Mounting set PMHP-BFS1

Slider for high profile PMGW3





Dimensions informative only. For guaranteed dimensions consult factory.

Mounting

Precautions

Magnetic strips and pole wheels will be damaged by strong magnetic fields.

Keep a safe distance to magnetic clamps and other magnetic fields!

The accuracy of magnetic strips and pole wheels will be reduced by by low magnetic fields.

Keep a safe distance to ferromagnetic materials!

Especially magnetic strips and pole wheels may have **mutual interaction**. These parts shouldn´t touch each other and must not be stored in direct contact.

Magnetic strip

The magnetic strip must be mounted evenly on the mounting surface ensuring that it is perfectly level and free of bumps. It must also extend the measuring range by 20/25 mm at each end.

Note: In order to achieve an optimum adhesion, the mounting surface should first be cleaned of undesirable substances such as oil, grease, dust etc. The surface should also be dry, and contact pressure of the magnetic tape to the surface be as high as possible. The optimum temperature in dry rooms is between 20 and 30 °C.

To fix longer magnetic strips it is advisable to remove the protective plastic for a short length and fix one end onto the surface. Then align the rest of the magnetic strip and remove the protective film step by step while pressing the strip to the surface simultaneously.

Procedure:

1. Clean the mounting surface carefully
2. Remove the protective plastic film from the adhesive side of the magnetic strip
3. Mount the magnetic strip with the magnetically active (dark) side upwards
4. Clean the surface of the magnetic strip carefully
5. Remove the protective plastic film from the masking tape
6. Mount the masking tape onto the magnetic strip, exactly matching to the magnetic strip at both ends

Mounting hint

The simple mounting method described above is suitable only for protected environments. The optimum protection is given by mounting the magnetic strip in a groove of a size that the magnetic strip can be embedded completely.

Mounting (continuation)

Magnetic strip in low profile

Mounting the magnetic strip in the low profile PMFP is recommended if a suitable mounting surface (see previous page) is not available.
The low profile is sold by the meter (max. length 3 m). Separate profile rails can be connected in any order using the connecting pins PMP-VS1. Some additions must be observed for a customer´s pre-cut of the used magnetic strip and the masking tape PMAB:

Model of magnetic strip	Without reference/ end position marks	With reference marks (option R1, R2)	With end position marks (option E1, E2)
Pre-cut length of masking tape/ profile rail	Measurement length + 40 mm	Measurement length + 40 mm	Measurement length + 50 mm

Procedure:

1. Clean the mounting surface carefully
2. Connect low profile rails with connecting pins (for lengths more than 2850 mm)
3. Remove the protective plastic film from the adhesive side of the magnetic strip (possibly a shorter length first)
4. Mount the magnetic strip with the magnetically active (dark) side upwards (check the position of reference or end position mark(s) if existing)
5. Clean the surface of the magnetic strip carefully
6. Remove the protective plastic film from the masking tape (possibly a shorter length first)
7. Mount the masking tape onto the magnetic strip, exactly matching to the magnetic strip at both ends

Mounting (continuation)

Magnetic strip in high profile

The use of the high profile PMHP in combination with the slider PMGW3 is recommended if a precise guiding of the sensor head above the magnetic strip (within the given tolerances) is not possible.
The high profile is sold by the meter (max. length 3 m). Separate profile rails can be connected in any order using the connecting pins PMP-VS1. The end parts PMHP-ES1 must be mounted on both ends. Some additions must be observed for a customer´s pre-cut of the used magnetic strip and the masking tape PMAB:

Ausführung Magnetband	Without reference/ end position marks	With reference marks (option R1, R2)	With end position marks (option E1, E2)
Pre-cut length of profile rail	Measurement length + 120 mm	Measurement length + 120 mm	Measurement length + 130 mm

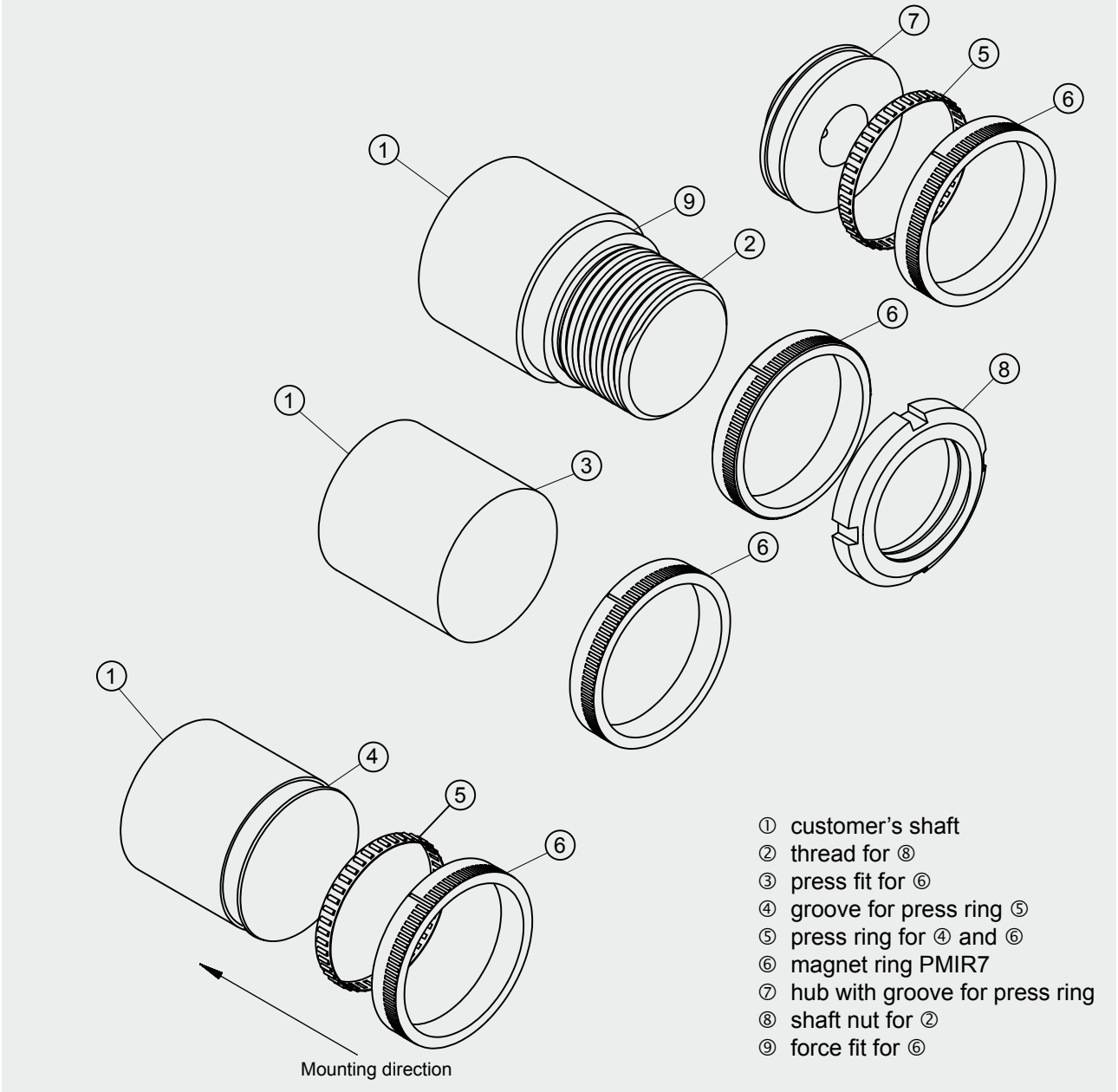
Procedure:

1. Clean the mounting surface carefully
2. Connect high profile rails with connecting pins (for lengths more than 2850 mm)
3. Remove the protective plastic film from the adhesive side of the magnetic strip (possibly a shorter length first)
4. Mount the magnetic strip with the magnetically active (dark) side upwards (check the position of reference or end position mark(s) if existing)
5. Clean the surface of the magnetic strip carefully
6. Remove the protective plastic film from the masking tape (possibly a shorter length)
7. Mount the masking tape onto the magnetic strip, exactly matching to the magnetic strip at both ends
8. Insert the slider into the high profile
9. Mount the end part on both ends of the profile

How to mount the PMIR7/PMIR7N magnet rings

The PMIR7/PMIR7N magnet rings can be mounted in several ways on the customer's shaft resp. hub:

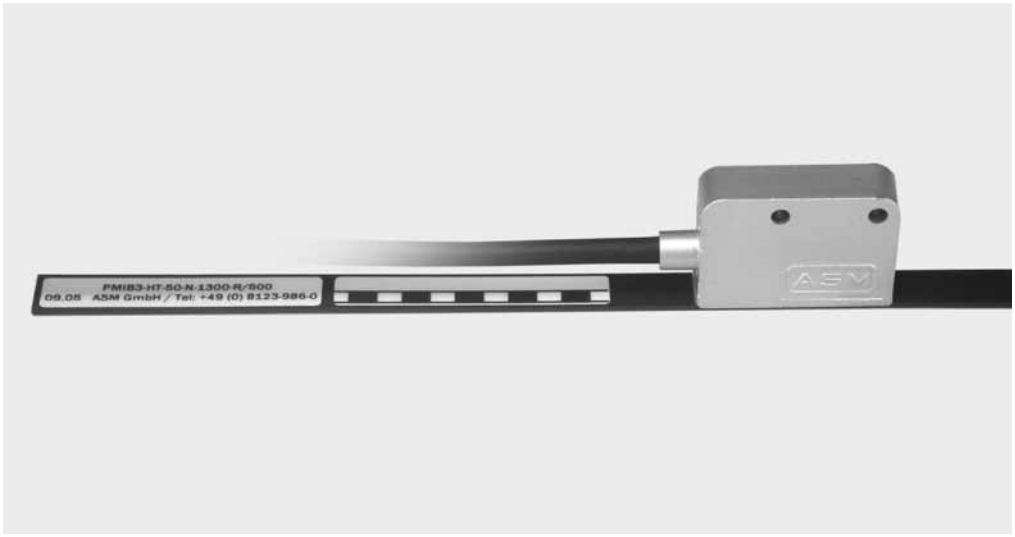
- press ring
- press fit
- bonding
- shaft nut



Mounting (continuation)

Sensor head

Mount the sensor head with two screws M3 through the mounting holes 3,5 mm dia.).
Secure the cable so that there is no risk of damage by cable tension or other machine parts. Use protecting hose and/or cord grip if necessary.
Check for the correct orientation of the sensor head (refer to the picture below).

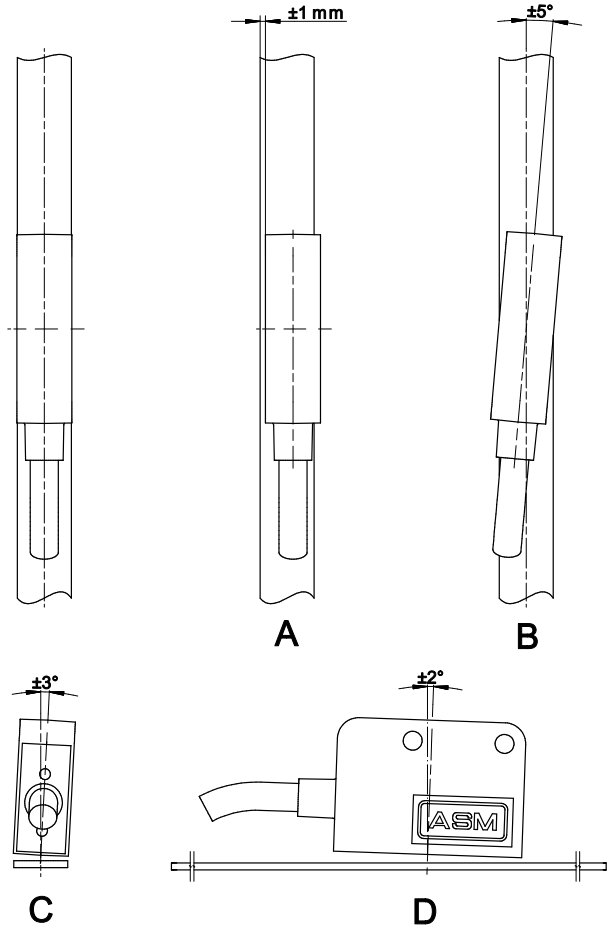


The distance between sensor head and magnetic strip (without masking tape should be *0,1 ... 0,8 mm* for a magnetic period of 2 mm resp. *0,1 ... 2 mm* for a magnetic period of 5 mm (refer to data sheet). The sensor head must not touch the magnetic strip.
The status output signal and the status indicator are activated if the allowable maximal distance or the maximum velocity have been exceeded. The velocity tolerance results from the maximal pulse frequency and the resolution, both indicated at the type label.

V_{max}[m/s] = (resolution [µm] x 4 x pulse frequency [kHz] / 1000) - 20%

Example: Resolution 50 µm, pulse frequency 50 kHz
V_{max} = (50 x 4 x 50 / 1000) - 20% = 8 m/s

Mounting
(continuation)



Electrical installation

Informations about electromagnetic compatibility (EMC)

- Install the complete unit to meet the EMC standards. The installation environment can affect the function of the sensor head.
- Make a separate voltage supply available for the POSIMAG sensor head with consumers with high interference levels.
- Use shielded sensor cables.
- When sensor is mounted on moving machine parts connect them to protective ground.
- Keep sensor cable well separated from power wiring. Use separate conduit or ducts.

Connection of the cable shield

- The housing of the sensor head is connected to the cable shield. Depending on the facility and the interference environment an isolated or a conductive mounting is necessary.
- **We recommend: connect the cable shield at cable inlet of switch cabinet to protective ground and mount the sensor head isolated.**
- A possible alternative connection is to use a conductive mounting of the sensor head and to connect the cable shield to the protective pround of the switch cabinet.

Technical Data	Outputs	Incremental encoder output with differential Push-Pull output, TTL/24V, TTL/RS-422 or HTL compatible							
	Excitation voltage	HTL, TTL/24V: 10 ... 30 V DC TTL/RS422: 5 V DC ±5 %							
	Excitation current	50 mA to 300 mA, depending on the pulse frequency, cable length and load							
	Magnetic period of the sensor	2 mm				5 mm			
	Guided spacing between sensor and magnetic tape (X_Z)	0.1 ... 0.8 mm				0.1 ... 2 mm			
	Linearity (sensor with magnetic strip PMIB3)	15 µm ±40 µm/m				30 µm ±40 µm/m			
	Linearity (with magnetic wheel PMIRX)	±0.1				±0.1			
	Repeatability	±1 digit				±1 digit			
	Resolution with ext. 4 times counting mode [µm]	5	10	20	50	10	25	50	125
	Max. velocity with f_p=50 kHz [m/s] (20 kHz: x 0.4; 10 kHz: x 0.2)	0.8	1.6	3.2	8	1.6	4	8	20
	Max. pulse frequency f_p	50 kHz, 20 kHz, 10 kHz (standard 50 kHz)							
	Output signals	A, $\overline{A}$, B, $\overline{B}$, zero pulse Z, $\overline{Z}$, end position signal E, $\overline{E}$, status signal $\overline{ERR}$ (only with HTL output, single ended)							

A POSIMAG® measuring system consists of the sensor head PMIS3 and the magnetic tape PMIB3 with the same magnetic period. The subsequent counting device must be able to process the specified maximum pulse frequency of the sensor.

Output signals	Saturation voltage	U_H, U_L = 0.2 V U_H, U_L = 0.4 V C_{Last} < 10 nF	I_{out} = ±10 mA I_{out} = ±30 mA	($U_H = U_B - U_{out}$)
	Short circuit current	I_{SL}, I_{SH} < 800 mA I_{SL}, I_{SH} < 90 mA		(U_H, U_L = 0 V) (U_H, U_L = 1.5 V)
	Rise time	t_r, t_f < 200 ns with cable length 1 m, 10 % ... 90 %		

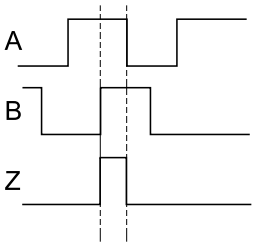
Load and pulse frequency in dependence on the cable length	**Load/cable length**	**Load and pulse frequency f_p**		
		HTL single ended U_B=24V	**TTL/RS422 differential**	**TTL/24V** U_B=24V
	Output current max.	50 mA	50 mA	10 mA
	R_{Load} min.	500 Ω	100 Ω	500 Ω
	C_{Load} max.	10 nF	10 nF	1 nF
	200 m	15 kHz	–	–
	100 m	25 kHz	100 kHz	–
	50 m	50 kHz	200 kHz	50 kHz
	10 m	100 kHz	300 kHz	100 kHz

The maximum length of the integrated sensor cable is for TTL: **3 m**
HTL/TTL24V: **20 m**

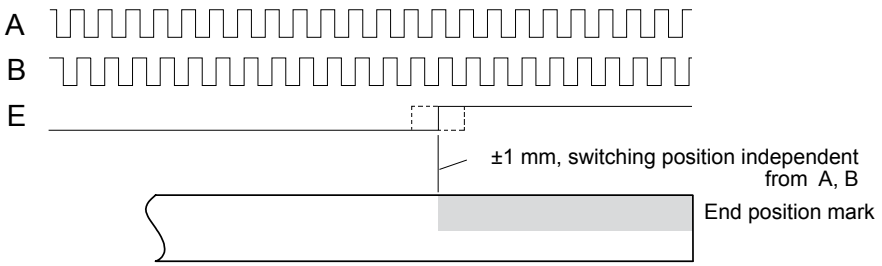
Note: For longer distances you must use **0.5 mm²** wire for Excitation+ and Excitation GND (see signal wiring next page). All signal wires must be **0.14 mm²** min.

Output signals

Option Z1
(reference pulse)



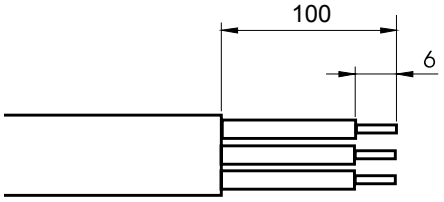
Option Z2
(end position signal)



Signal wiring / connection	Signal name / Option	Z0	Z1	Z2	Z3*	Open cable end, cable color	Conn. D-Sub, 15 pin pin no.	Conn. D-Sub 9 pin pin no.	Conn. M12 8 pin pin no.
	Excitation + (U_B)					White	1	1	1
	Excitation GND (0V)					Brown	2	5	2
		B	B	B	B	Green	6	2	3
		A	A	A	A	Yellow	4	3	4
		$\overline{B}$	$\overline{B}$	$\overline{B}$	$\overline{ERR}$	Grey	7	7	5
		$\overline{A}$	$\overline{A}$	$\overline{A}$	–	Pink	5	6	6
		–	Z	$\overline{E}$	Z	Blue	8	4	7
		–	$\overline{Z}$	E	–	Red	9	8	8
	Screen					Black	Housing	9	

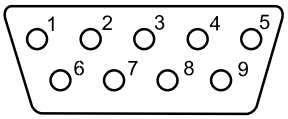
Z = Reference pulse
E = End position signal
$\overline{ERR}$ = Status signal, periodical approx. 16 Hz, for side tracking and velocity errors
* = Status signal $\overline{ERR}$ available only with HTL (single ended) output

Note: Unused wires are connected inside the sensor head. Do not connect unused wires to each other or to supply or ground potential. Isolate and secure unused wires at switch cabinet terminal.

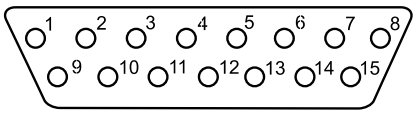


Dimensions cable output

9 pin



Connector D-Sub (Pin)
View to connector pins



15 pin

Option TTL/S

Connection diagram for sensors having excitation sense line.

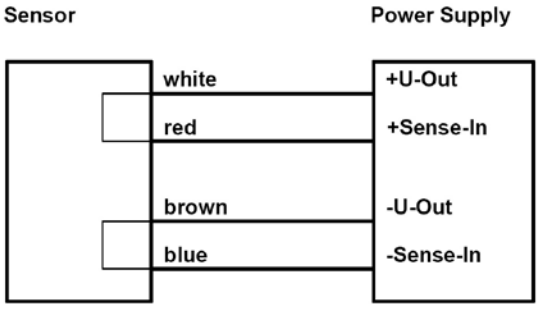
Signal wiring / connection

Signal name	Wire color
Excitation +	White
Excitation GND	Brown
Excitation+_sense	Red
GND_sense	Blue
B	Green
$\overline{B}$	Grey
A	Yellow
$\overline{A}$	Pink

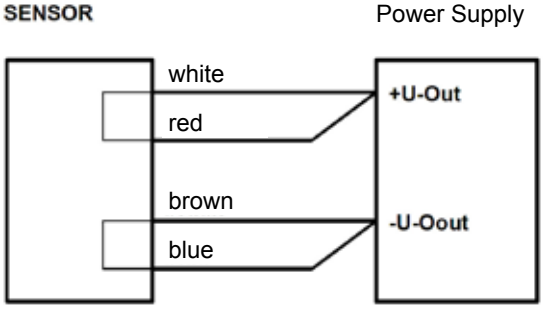
The signals EXCITATION+ and EXCITATION +_SENSE as well as the signals GND and GND_SENSE are connected in the sensor.

If cable length exceeds 3m exitation care has to be given for a supply voltage tolerance 5V±5% at the sensor head.

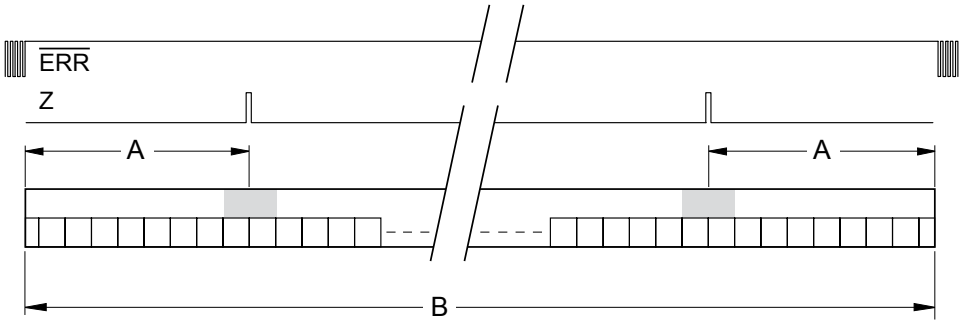
Wiring option 1:
Sense line EXCITATION+SENSE and GND_SENSE are wired as feed back for power supply having sense input.



Wiring option 2:
Sense line EXCITATION+SENSE and GND_SENSE are wired parallel to reduce supply line resistance.



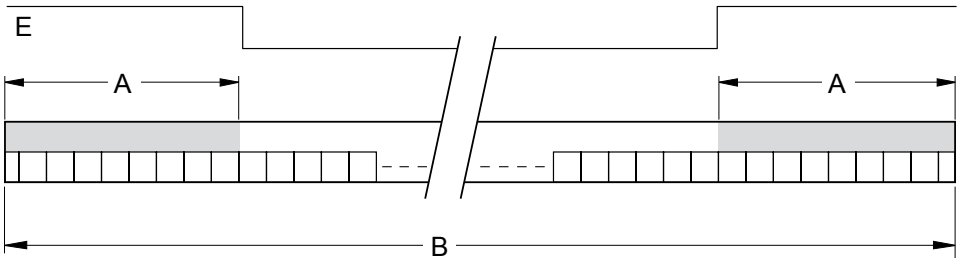
Position of the reference marks (standard)



Dimensions Reference	Magnetic period	Switching position A	Total length B
	2 mm	20.0 ±1 mm	Measurement length + 40 mm
	5 mm		
	2 mm with high profile	60.0 ±1 mm	Measurement length + 120 mm
	5 mm with high profile		

Additional reference marks every 4 mm (period 2 mm) resp. 10 mm (period 5 mm) from the left hand side.

Position of the end position marks



Dimensions End position	Magnetic period	Switching position A	Total length B
	2 mm	21.0 ±1 mm	Measurement length + 50 mm
	5 mm	22.5 ±1 mm	Measurement length + 50 mm
	2 mm with high profile	61.0 ±1 mm	Measurement length + 130 mm
	5 mm with high profile	22.5 ±1 mm	Measurement length + 130 mm

Reliability characteristics

Characteristics PMIS3/PMIS4	Failure rate (λ_F)	298 Fit [1 x 10^{-9}/h]
	MTBF ($1/\lambda_F$)	380 years
	Service life	20 years
PMIR7/PMIR7N	Service life	15 years
PMIB3	Service life	15 years

Life time calculation according to MIL-HDBK-217 FN2
Environment: T = 40 °C, ground equipment

Cable specification	Halogen free flexible cable 12FCF11Y, 8 x 0,14sqmm TPE, stranded, shielded Outer jacket polyurethan (PUR), diameter 5,2+/-0,2mm according to UL 20233, CSA, drag chain compatible bending radius 10 x diameter, 10 million cycles, bending radius fixed installation 5 x diameter

Declaration of Conformity

The Position Sensor

Manufacturer:	ASM GmbH Am Bleichbach 18 - 22 85452 Moosinning Germany
Model:	**PMIS3, PMIS4**
Options:	- HTL, - TTL, - TTL24V

complies with the following standards and directives:

Directives:	2014/30/EU
Standards:	EN 61326-1:2013 (EMC)

Moosinning, 22nd 02.2016

i.A. Andreas Bolm
Quality Manager

i.A. Peter Wirth
Head of Development

ASM GmbH Automation • Sensorik • Messtechnik
Am Bleichbach 18-24 85452 Moosinning / Germany
Telephone: +49 8123 986-0 Telefax: +49 8123 986-500
Internet: www.asm-sensor.de www.asmsensors.com
E-Mail: info@asm-sensor.de info@asmsensors.com