Линейные датчики перемещения TF, TM1 со вставным фланцем, с винтовым фланцем, TFD-4000, F200, LWX-003, LWX-004, PTX

Технические характеристики

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Тула (4872)33-79-87
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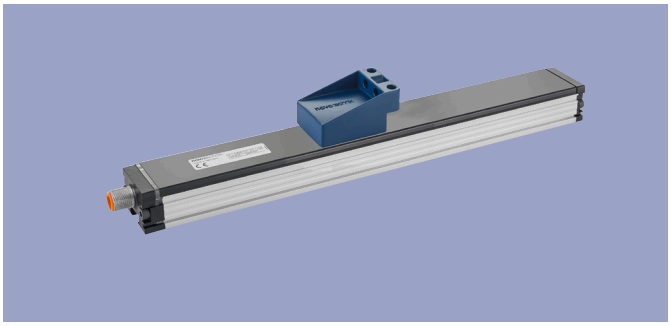
Россия +7(495)268-04-70
Казахстан +7(727)345-47-04
Беларусь +(375)257-127-884
Узбекистан +998(71)205-18-59
Киргизия +996(312)96-26-47

эл.почта: nkf@nt-rt.ru || сайт: https://novotechnik.nt-rt.ru/

novotechnik
Siedle Group

NOVOPAD
Transducer
up to 1000 mm
touchless

Series TF1

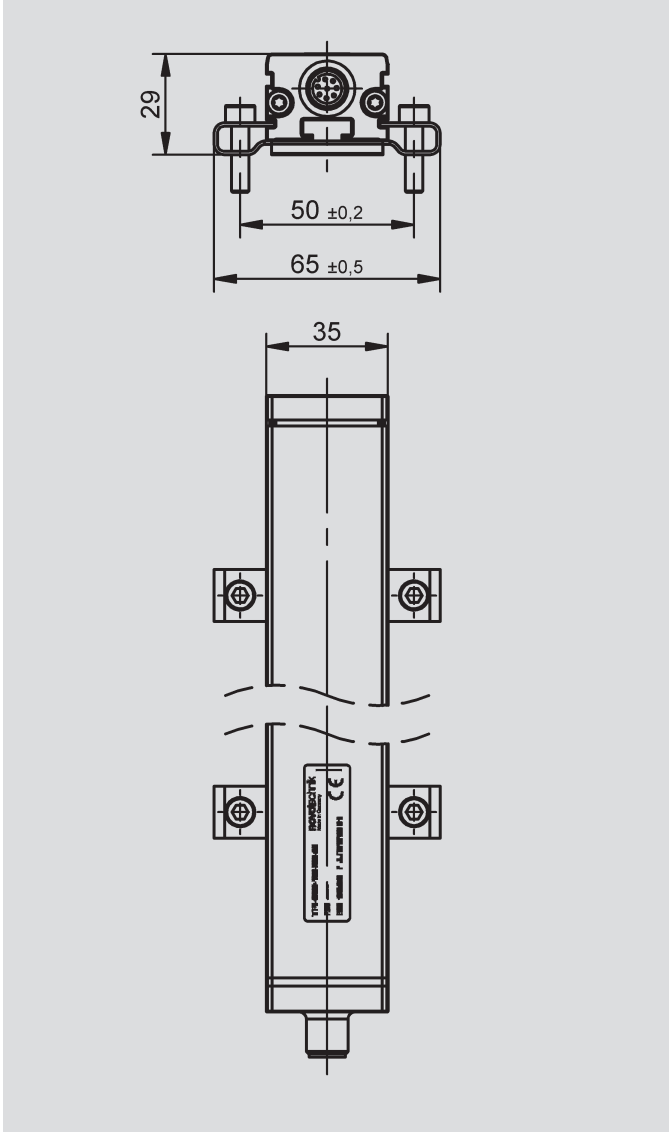


Special features

- Inductive measurement technology
- Magnetic field resistant
- Touchless, wear-free
- High dynamic, 10 kHz update rate
- Reproducibility up to 5 µm
- Protection class IP67: a GORE membrane ensures pressure equalization due to temperature change
- Offset tolerance up to ±2 mm
- Low temperature coefficient <15 ppm/K
- Insensitive to shock and vibration
- Position-Teach-In
- Interfaces: Analog, SSI, CANopen, IO-Link

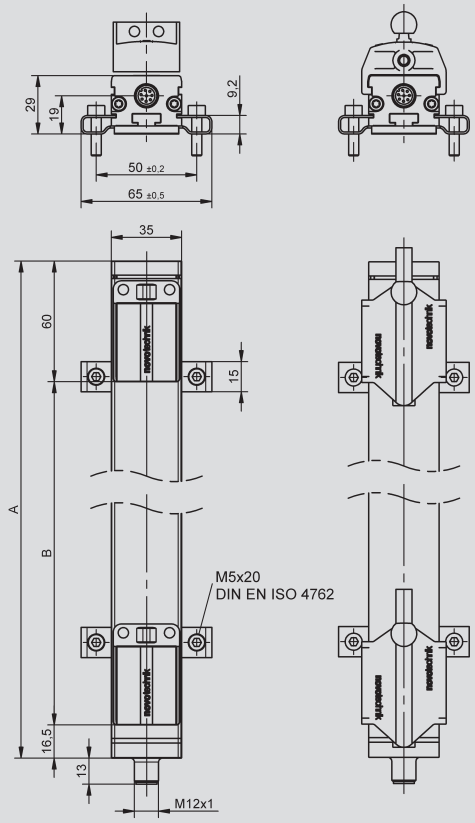
Applications

- Manufacturing Engineering
  - Plastic injection molding
  - Textile
  - Packaging
  - Sheet metal working
  - Woodwork
- Automation Technology



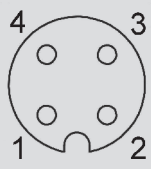
Contents

Mechanical Data

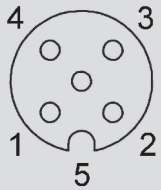


Description		
Materials	Housing: anodized aluminum AlMgSi0,5 F22, 3.3206.71 Inner housing: PA6 GF30 End flanges: aluminum G AlSi12Cu1 (FE) Status display (LED): PC	
Mounting	Adjustable clamps (included in delivery) or slot nut f.e. nut M8 DIN 439	
Position marker	Floating position marker, plastic Guided position marker, plastic, with angle or axial joint	
Electrical connections	Connector M12x1, 4-pin / 5-pin / 8-pin, shielded	
Electronic	Connector casing is connected to the sensor housing Housing is capacitively decoupled to the electronics	
Others	2 x multifunction LED as an indicator of operating voltage and status	
Mechanical Data		
Dimensions	see dimension drawing	
Length of housing (dimension A)	Dimension B + 76.5	mm
Electrical measuring range (dimension B)	0100 up to 1000 mm in 100 mm steps, other lengths on request	
Weight	220 +1.1 x B (in mm)	g
Max. operational speed with valid output signal	10	ms^{-1}
Max. operational acceleration with valid output signal	200	ms^{-2}
Shock (IEC 60068-2-27)	100 (11 ms) (single hit)	g
Vibration (IEC 60068-2-6)	20 (5...2000 Hz, Amax = 0.75 mm)	g
Protection class (DIN EN 60529)	IP67 pressure equalization via GORE membrane, with fastened connector	
Life	Mechanically unlimited (with floating position marker)	
Operating temperature range	-40 ... +85 (CANopen: -40 ... +75)	°C
Storage temperature range	-40 ... +85	°C
Operating humidity range	0 ... 95 (no condensation)	% R.H.

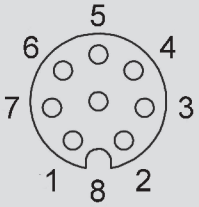
Pin assignment M12
A-coded



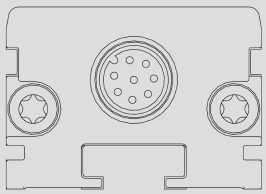
Pin assignment M12
A-coded



Pin assignment M12
A-coded



Orientation of connector M12



Technical Data
Analog Versions

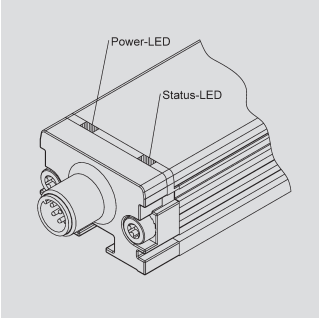
Type designations	TF1- _ _ _ _-001 - 41 _ - 102 Voltage	TF1- _ _ _ _-001 - 42 _ - 102 Current	
Electrical Data			
Electrical measuring range (dimension B)	0100 up to 1000		mm
Output signal	0,1 ... 10 V (load ≥ 5 kΩ)	4 ... 20 mA (burden ≤ 500 Ω)	
Number of channels	1		
Update rate (internal)	> 10		kHz
Signal propagation delay	< 1		ms
Resolution			
Dimension B ≤ 400 mm	10		µm
Dimension B > 400 mm	20		µm
Absolute linearity	≤ 0.025 (min. ± 100 µm)		±% FS
Tolerance of electr. zero point	1		± mm
Reproducibility			
Dimension B ≤ 400 mm	10		µm
Dimension B > 400 mm	20		µm
Hysteresis	≤ 10		µm
Temperature error	≤ 15 (min. 0.01 mm/K)		ppm/K
Supply voltage	24 (18 ... 32)		VDC
Supply voltage ripple	≤ 10		% Vss
Power drain (w/o load)	2.4		W
Overvoltage protection	36 (permanent)		VDC
Polarity protection	Yes, up to supply voltage max		VDC
Short circuit protection	Yes (outputs vs. GND and supply voltage max.)		
Insulation resistance (500 VDC)	≥ 10		MΩ
Environmental Data			
MTTF (IEC 60050)	182		Years
Functional safety	If you need assistance in using our products in safety-related systems, please contact us		
EMC compatibility CE	EN 61000-4-2 Electrostatic discharges (ESD) 4 kV, 8 kV EN 61000-4-3 Electromagnetic fields 10 V/m EN 61000-4-4 Fast transients (burst) 1 kV EN 61000-4-6 Conducted disturbances, induced by RF-fields 10 V eff. EN 55016-2-3 Radiated disturbances class B		

Unless otherwise stated, the specified technical data applies to the use of a floating position marker. Tolerances and play in assembly and coupling may have a direct impact on the specified technical data.

Pin assignment

Connector M12 code 102	Connector with cable (Accessories)	Analog voltage	Analog current
PIN 1	WH	do not connect	4 ...20 mA
PIN 2	BN	Signal GND	Signal GND
PIN 3	GN	do not connect	do not connect
PIN 4	YE	PROG_L *	PROG_L *
PIN 5	GY	0 ... +10 V	do not connect
PIN 6	PK	GND	GND
PIN 7	BU	Supply voltage	Supply voltage
PIN 8	RD	PROG _H *	PROG_H *

*) connect only for Teach-In-function (see manual).



LED functionality

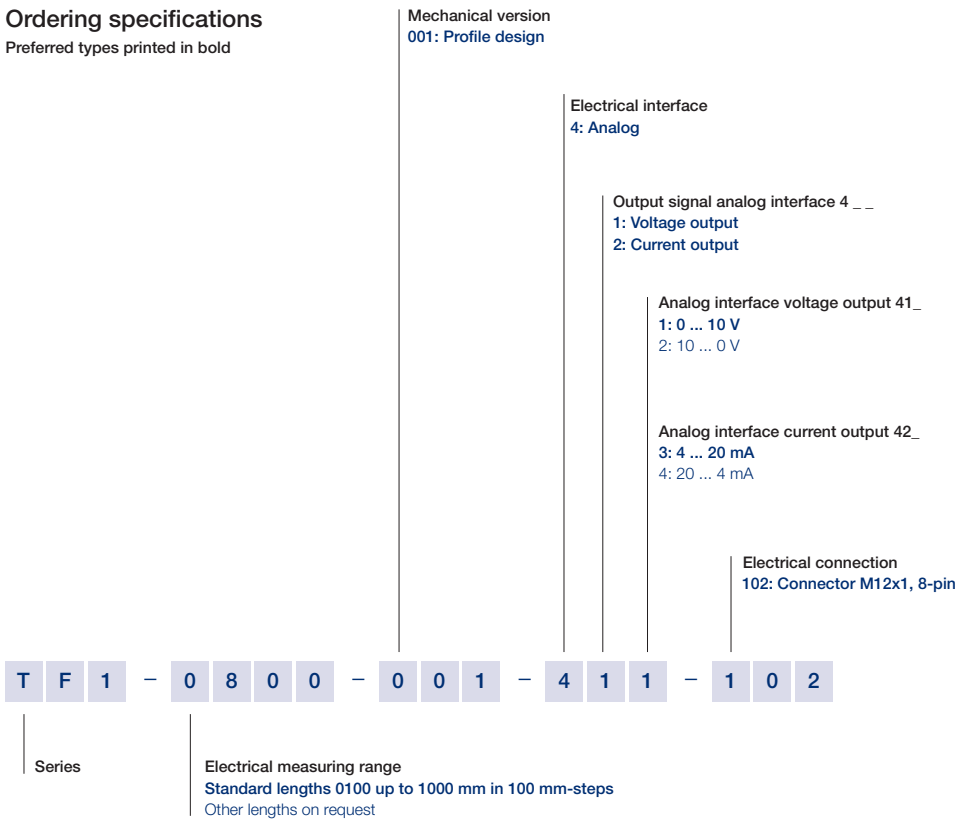
LED colour	Power LED for operating mode indication	Status LED for measuring range indication / functional test
Off	Sensor out of operation (no supply)	
Green	Sensor in operation	Position marker is within measuring range
Red flashing		Position marker is outside of measuring range
Red		Sensor error, internal diagnosis allows no valid signal output (f.e. absence of position marker)
Further conditions see operating manual		

FS = Full scale: Signal span according to electrical measuring range

Ordering Specifications Analog Versions - Voltage - Current

Ordering specifications

Preferred types printed in bold



Important: Avoid equalizing currents in the cable shield caused by potential differences.
Shielded cable is recommended.

Accessories included in delivery
- Adjustable clamps and cylinder screws DIN EN ISO 4762 M5x20

Technical Data
SSI-Interface

Type designations	**TF1 - _ _ _ _ - 001 - 2_ _ - 102** **Synchronous-serial interface (SSI)**			
Electrical Data				
Electrical measuring range (dimension B)	0100 up to 1000			mm
Protocol	SSI 24 and 25 bit			
Inputs	RS422, CLK lines galvanically isolated by optocouplers			
Monoflop time (tm)	20			µs
Encoding	Gray, Binary			
Update rate	> 10			kHz
Resolution (LSB)	1, 5 or 10			µm
Reproducibility (rounded to LSB)	High prec mode	Balanced mode	High speed mode	
Dimension B ≤ 400 mm	< 5	< 10	< 20	µm
Dimension B > 400 mm	< 8	< 15	< 40	µm
Signal propagation delay	< 3	< 1	< 0.2	ms
Hysteresis	≤ 5	≤ 10	≤ 10	µm
Absolute linearity	≤ 100			± µm
Tolerance of electr. zero point	1			± mm
Temperature error	≤ 15 (min. 0.01 mm/K)			ppm/K
Supply voltage	24 (18 ... 32)			VDC
Supply voltage ripple	≤ 10			% Vss
Power drain (w/o load)	2.4			W
Overvoltage protection	36 (permanent)			VDC
Polarity protection	Yes, up to supply voltage max.			
Short circuit protection	Yes (outputs vs. GND and supply voltage up to 7 V)			
Ohmic load at outputs	> 120			Ω
Max. clock rate	1.5			MHz
Insulation resistance (500 VDC)	≥ 10			MΩ
Environmental Data				
MTTF (IEC 60050)	150			Years
Functional safety	If you need assistance in using our products in safety-related systems, please contact us			
EMC compatibility CE	EN 61000-4-2 Electrostatic discharges (ESD) 4 kV, 8 kV EN 61000-4-3 Electromagnetic fields 10 V/m EN 61000-4-4 Fast transients (burst) 1 kV EN 61000-4-6 Conducted disturbances, induced by RF-fields 10 V eff. EN 55016-2-3 Radiated disturbances class B			

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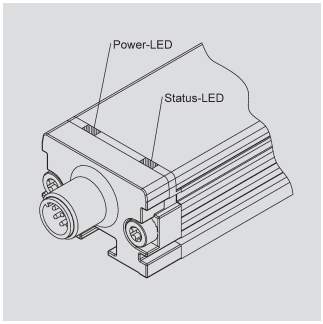
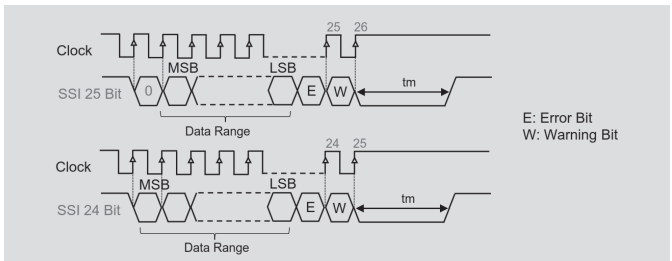
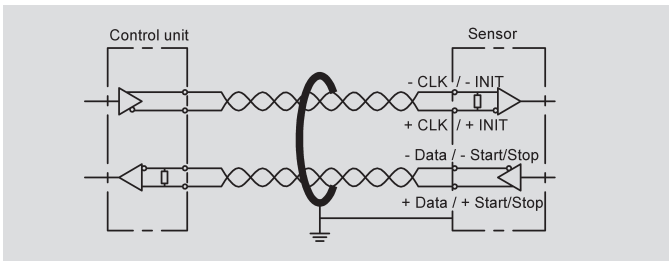
Technical Data
SSI-Interface

Pin assignment		
Output connector code 102	**Connector with cable (Accessories)**	**SSI-Interface**
PIN 1	WH	Clk +
PIN 2	BN	Data +
PIN 3	GN	Clk -
PIN 4	YE	do not connect
PIN 5	GY	Data -
PIN 6	PK	GND
PIN 7	BU	Supply voltage
PIN 8	RD	do not connect

LED functionality		
LED colour	**Power LED for operating mode indication**	**Status LED for measuring range indication / functional test**
Off	Sensor out of operation (no supply)	
Green	Sensor in operation	Position marker is within measuring range
Red flashing		Position marker is outside of measuring range
Red		Sensor error, internal diagnosis allows no valid signal output (f.e. absence of position marker)
Further conditions see operating manual		







Ordering Specifications Digital Versions SSI-Interface

Ordering specifications

Preferred types printed in bold

Mechanical version
001: Profile design

Electrical interface
2: SSI

Output signal SSI interface 2 _ _
A: SSI 24 bit, Gray
B: SSI 25 bit, Gray
C: SSI 24 bit, Binary
D: SSI 25 bit, Binary

Synchron-Serial interface 2 _ _
High prec mode
4: Resolution 1 µm
5: Resolution 5 µm
6: Resolution 10 µm

Balanced mode
1: Resolution 1 µm
2: Resolution 5 µm
3: Resolution 10 µm

High speed mode
7: Resolution 1 µm
8: Resolution 5 µm
9: Resolution 10 µm

Electrical connection
102: Connector M12x1, 8-pin

T	F	1	–	0	8	0	0	–	0	0	1	–	2	A	2	–	1	0	2

Series

Electrical measuring range
Standard lengths 0100 up to 1000 mm, in 100 mm-steps
Other lengths on request

Important: Avoid equalizing currents in the cable shield caused by potential differences.
Shielded twisted pair cable (STP) is recommended.

Accessories included in delivery
- Adjustable clamps and cylinder screws DIN EN ISO 4762 M5x20

Technical Data

CANopen®

Type designations	**TF1 - _ _ _ _ -001- 6 _ _ - 106** **CANopen**		
Electrical Data			
Measured variables	Position, speed and temperature		
Electrical measuring range (dimension B)	0100 up to 1000		mm
Measuring range speed	0 ... 10		ms^{-1}
Output signal / protocol	CANopen protocol to CiA DS-301 V4.2.0, Device profile DS-406 V3.2 Encoder class 1, LSS services to CiA DS-305 V1.1.2		
Programmable parameter	Cams, working areas, node-ID, baud rate		
Node-ID	1 ... 127 (default 127)		
Baud rate	20 ... 1000		kBaud
Update rate (output)	1		kHz
Resolution Position Resolution Speed	1 0.1	5 0.5	µm mms^{-1}
Reproducibility (rounded to resolution) Dimension B ≤ 400 mm Dimension B > 400 mm	High prec mode < 5 < 8	Balanced mode < 10 < 15	 µm µm
Signal propagation delay	< 3	< 1	ms
Hysteresis	≤ 5	≤ 10	µm
Absolute linearity	≤ 100		± µm
Tolerance of electr. zero point	1		± mm
Temperature error	≤ 15 (min. 0.01 mm/K)		ppm/K
Supply voltage	24 (18 ... 32)		VDC
Supply voltage ripple	≤ 10		% Vss
Power drain (w/o load)	2.4		W
Overvoltage protection	36 (permanent)		VDC
Polarity protection	Yes, up to supply voltage max.		
Short circuit protection	Yes (outputs vs. GND and supply voltage max.)		
Insulation resistance (500 VDC)	≥ 10		MΩ
Bus termination internal	no (internal load resistance 120 Ω on request)		
Environmental Data			
MTTF (IEC 60050)	196		Years
Functional safety	If you need assistance in using our products in safety-related systems, please contact us		
EMC compatibility CE	EN 61000-4-2 Electrostatic discharges (ESD) 4 kV, 8 kV EN 61000-4-3 Electromagnetic fields 10 V/m EN 61000-4-4 Fast transients (burst) 1 kV EN 61000-4-6 Conducted disturbances, induced by RF-fields 10 V eff. EN 55016-2-3 Radiated disturbances class B		

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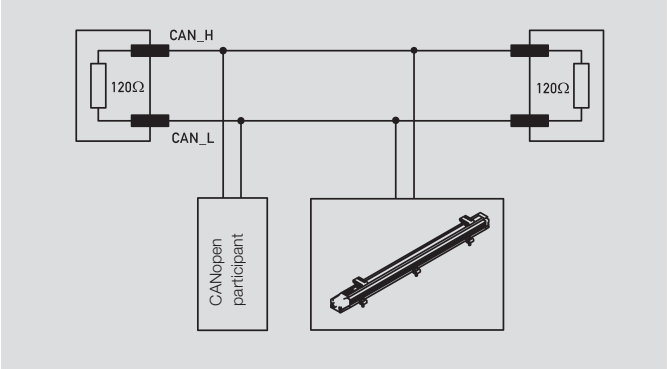
Technical Data

CANopen®



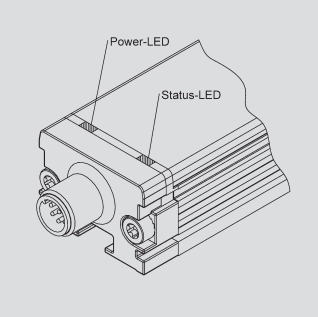
Pin assignment

Connector M12 code 106	Connector with cable (Accessories)	CAN
PIN 1	CAN-SHLD *	CAN_SHLD *
PIN 2	RD	Supply voltage
PIN 3	BK	GND
PIN 4	WH	CAN_H
PIN 5	BU	CAN_L

*) CAN_SHLD: CAN-shield, internally connected to housing

LED functionality

LED colour	Power LED for operating mode indication	Status-LED for measuring range indication / functional test
Off	Sensor out of operation (no supply)	
Green	Sensor in operation	Position marker is within measuring range
Red flashing		Position marker is outside of measuring range
Red		Sensor error, internal diagnosis allows no valid signal output (f.e. absence of position marker, CAN controller bus off)
Fast red flashing (flickering), green flashing (blinking) etc.		Sensor indicates CANopen bus status according to DS303-3
Further conditions see operating manual		



Technical Data
IO-Link

Type designations	TF1 - _ _ _ _ -001- A _ _ - 107 IO-Link		
Electrical Data			
Measured variables	Position, speed and temperature		
Electrical measuring range (dimension B)	0100 up to 1000		mm
Output signal / protocol	IO-Link Spec V1.1 to IEC 61131-9, Smart Sensor Profil (V1.0 compatible)		
Configurability	Measured variables (position, speed) The product variants listed in the ordering specifications (e.g., 1 x position) are also customer side configurable (to, e.g. 1 x position and 1 x speed)		
Programmable parameter	Zero point offset, resolution, averaging		
Transfer rate	COM 3 (230.4 kB)		
Frame type	2.2		
Minimum cycle time	1		ms
Update rate (output)	1		kHz
Resolution Position Resolution Speed	1 0.1	5 0.5	µm mms^{-1}
Reproducibility (rounded to resolution) Dimension B ≤ 400 mm Dimension B > 400 mm	High prec mode < 5 < 8	Balanced mode < 10 < 15	 µm µm
Signal propagation delay	4	1	ms
Hysteresis	≤ 5	≤ 10	µm
Absolute linearity	≤ 100		± µm
Tolerance of electr. zero point	1		± mm
Temperature error	≤ 15 (min. 0.01 mm/K)		± ppm/K
Supply voltage	24 (18 ... 32)		VDC
Supply voltage ripple	max. 10		%Vss
Power drain (w/o load)	2.4		W
Overvoltage protection	36 (permanent)		VDC
Reverse voltage	yes, up to supply voltage max.		
Short circuit protection	yes (output vs. GND and supply voltage max.)		
Insulation resistance (500 VDC)	≥ 10		MΩ
Environmental Data			
MTTF (IEC 60050)	196		Years
Functional safety	If you need assistance in using our products in safety-related systems, please contact us		
EMC compatibility CE	EN 61000-4-2 Electrostatic discharges (ESD) 4 kV, 8 kV EN 61000-4-3 Electromagnetic fields 10 V/m EN 61000-4-4 Fast transients (burst) 1 kV EN 61000-4-6 Conducted disturbances, induced by RF-fields 10 V eff. EN 55016-2-3 Radiated disturbances class B		

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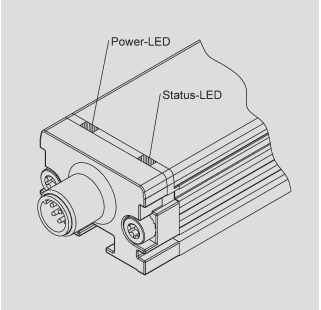
Pin assignment

Connector M12 Code 107	Connector with cable (Accessories)	IO-Link
PIN 1	BN	Supply voltage
PIN 2	WH	do not connect (alternatively to GND)
PIN 3	BU	GND
PIN 4	BK	C/Q

LED functionality

LED colour	Power LED for operating mode indication	Status-LED for measuring range indication / functional test
Off	Sensor out of operation (no supply)	
Green	Sensor in operation	Position marker is within measuring range
Red flashing		Position marker is outside of measuring range
Red		Sensor error, internal diagnosis allows no valid signal output (f.e. absence of position marker)
Further conditions see operating manual		



Ordering Specifications

CANopen
IO-Link

Ordering specifications

Preferred types printed in bold

Mechanical version
001: Profile design

Electrical Interface
6: CANopen
A: IO-Link

Interface parameter for CANopen 6 _ _
1: Resolution 5 µm, balanced mode, position and speed
3: Resolution 1 µm, high prec mode, position and speed

Interface parameter for IO-Link A _ _
11: Resolution 5 µm, balanced mode, position
12: Resolution 5 µm, balanced mode, position and speed
31: Resolution 1 µm, high prec mode, position
32: Resolution 1 µm, high prec mode, position and speed

Baudrate CANopen 6 _ _
1: Baud rate 1000 kBaud
2: Baud rate 800 kBaud
3: Baud rate 500 kBaud
4: Baud rate 250 kBaud
5: Baud rate 125 kBaud
7: Baud rate 50 kBaud
8: Baud rate 20 kBaud

Electrical Connection CANopen
106: Connector M12x1, 5-pin

Electrical Connection IO-Link
107: Connector M12x1, 4-pin

T	F	1	–	0	8	0	0	–	0	0	1	–	6	1	3	–	1	0	6

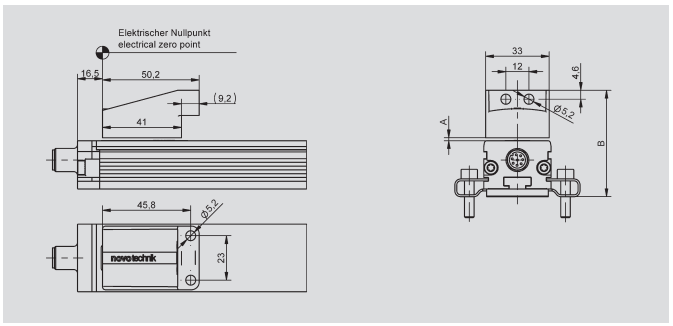
Series

Electrical measuring range
Standard lengths 0100 up to 1000 mm, in 100 mm-steps
Other lengths on request

Important for CANopen interface: Avoid equalizing currents in the cable shield caused by potential differences.
Shielded twisted pair cable (STP) is recommended.

Accessories included in delivery
• Adjustable clamps and cylinder screws DIN EN ISO 4762 M5x20

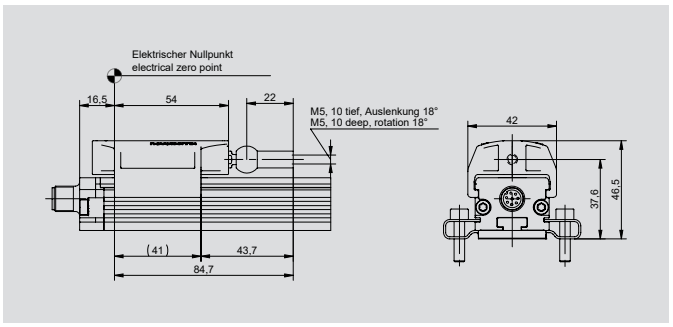
Position Markers



Floating position marker Z-TF1-P01

Working distance A Nominal distance	0 ... 4 mm 1.5 mm
Mounting (dimension B)	49 ... 53 mm
Perm. lateral offset	±2 mm
Material	PA6 GF30
Weight	approx. 40 g
P/N	400104343

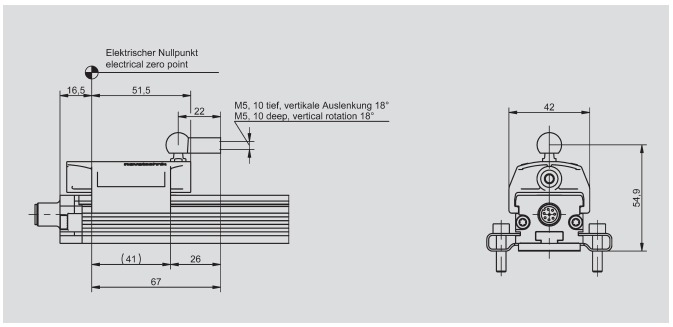
The position marker can be mounted in both directions.



Guided position marker with axial joint Z-TF1-P02

Material	POM
Material joint	Steel, galvanized
Weight	approx. 60 g
P/N	400104344

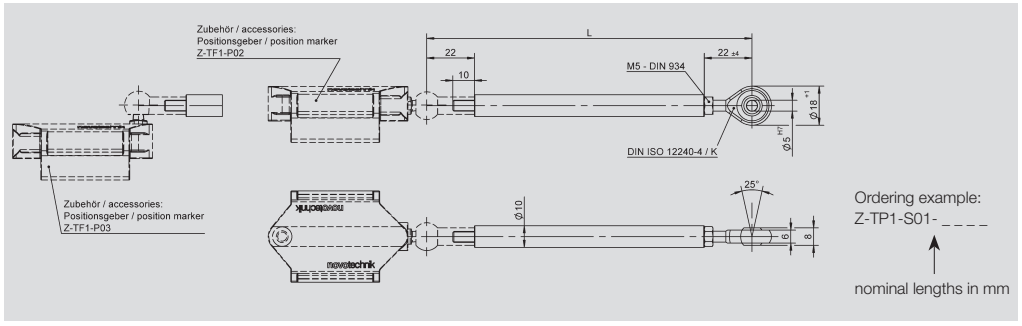
The position marker can be mounted in both directions.



Guided position marker with angle joint Z-TF1-P03

Material	POM
Material joint	Steel, galvanized
Weight	approx. 60 g
P/N	400104345

The position marker can be mounted in both directions.

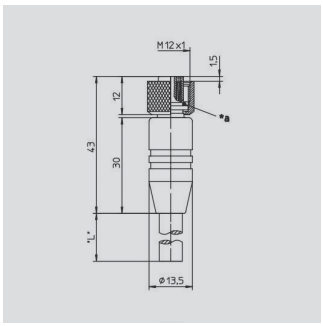


Actuating rod for guided position marker Z-TF1-P02/-P03

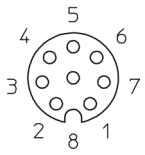
Material	Aluminum
Weight	approx. 150 g
Standard-nominal lengths (mm)	0075, 0100, 0125, 0150, 0200, 0250, 0300, 0350, 0400, 0450, 0500, 0600, 0800, 1000, 1500, 2000

Z-TP1-S01-_ _ _ _

Connector System M12



Pin assignment



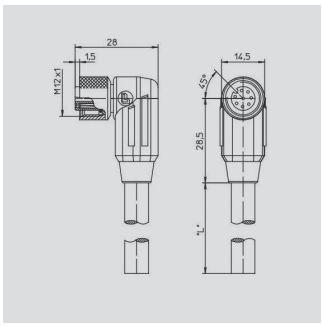
1 = white
2 = brown
3 = green
4 = yellow
5 = grey
6 = pink
7 = blue
8 = red

IP67 UL

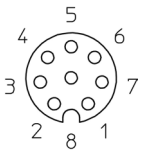
M12x1 Mating female connector, 8-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

Connector housing	Plastic PA
Cable sheath	PUR; Ø = max. 8 mm -25 °C...+80 °C (moved) -50 °C...+80 °C (fixed)
Wires	PP, 0.25 mm²

Length	Type	P/N
2 m	EEM 33-86	400005629
5 m	EEM 33-90	400005635
10 m	EEM 33-92	400005637



Pin assignment



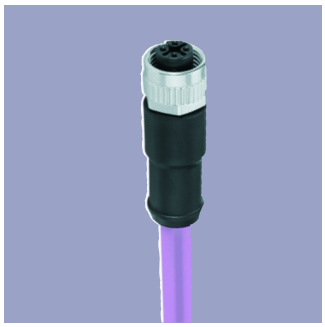
1 = white
2 = brown
3 = green
4 = yellow
5 = grey
6 = pink
7 = blue
8 = red

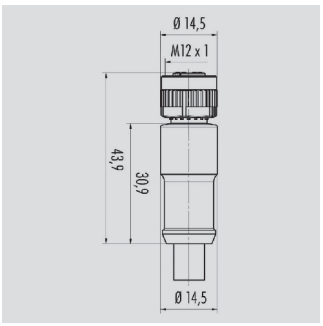
IP67 UL

M12x1 Mating female connector, 8-pin, angled, A-coded, with molded cable, shielded, IP67, open ended

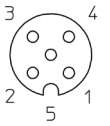
Connector housing	Plastic PA
Cable sheath	PUR; Ø = max. 8 mm, -25 °C...+80 °C (moved) -50 °C...+80 °C (fixed)
Wires	PP, 0.25 mm²

Length	Type	P/N
2 m	EEM 33-87	400005630
5 m	EEM 33-91	400005636
10 m	EEM 33-93	400005638





Pin assignment



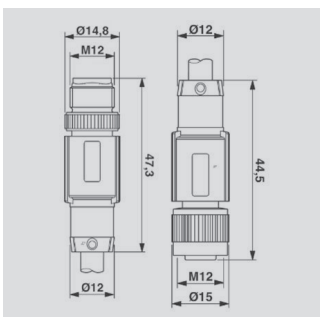
1 = Shield
2 = red (0.34 mm²)
3 = black (0.34 mm²)
4 = white (0.25 mm²)
5 = blue (0.25 mm²)

IP67 UL CANopen

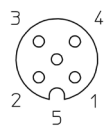
M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded, open ended, CAN-bus

Connector housing	PUR
Cable sheath	PUR Ø = max. 7.2 mm, -25 °C...+85 °C (moved)
Wires	PP 2x 0.25 mm² + 2 x 0.34 mm²

Length	Type	P/N
2 m	EEM 33-41	400056141
5 m	EEM 33-50	400106371
10 m	EEM 33-43	400056143



Pin assignment



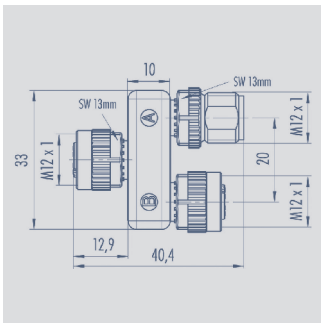
IP67 UL CANopen

M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), CAN-bus

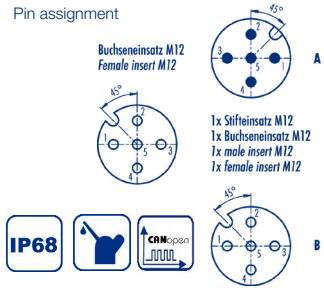
Connector housing	PUR
Cable sheath	PUR Ø = 6.7 mm, -25 °C...+90 °C (plug/socket) -20 °C...+80 °C (cable)
Wires	PE 2x 0.25 mm² + 2 x 0.34 mm²

Length	Type	P/N
5 m	EEM 33-52	400106373

Connector System M12



Pin assignment

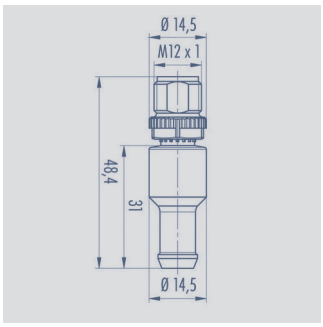


IP68 CANopen

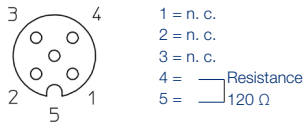
T-connector M12x1, 5-pin, A-coded, IP68, 1:1 connection, female - male - female, CAN-bus

Connector housing	PUR
Temperature range	-25 °C... +85 °C

Type EEM 33-45, P/N 400056145



Pin assignment

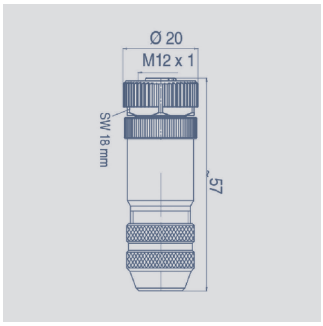


IP67 CANopen

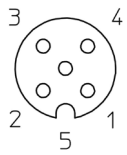
Terminating resistor M12x1, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-bus

Connector housing	PUR
Temperature range	-25 °C... +85 °C

Type EEM 33-47, P/N 400056147



Pin assignment

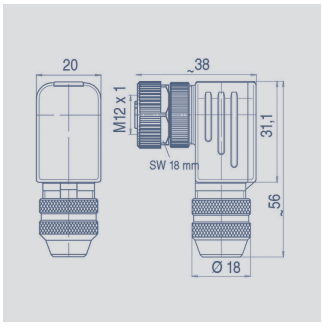


IP67 CANopen

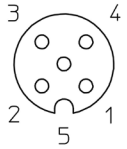
M12x1 Mating female connector, 5-pin, straight, A-coded, with coupling nut, screw termination, IP67, shieldable, CAN-bus

Connector housing	Metal -40 °C...+85 °C
For wire gauge	6...8 mm, max. 0.75 mm²

Type EEM 33-73, P/N 400005645



Pin assignment



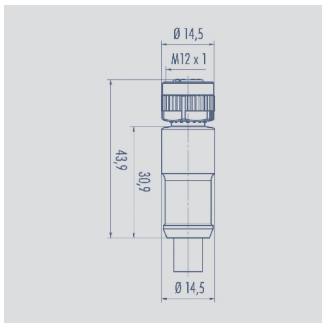
IP67 CANopen

M12x1 Mating female connector, 5-pin, angled, A-coded, with coupling nut, screw termination, IP67, shieldable, CAN-bus

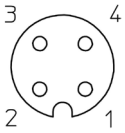
Connector housing	Metal -40 °C...+85 °C
For wire gauge	6...8 mm, max. 0.75 mm²

Type EEM 33-75, P/N 400005646

It is possible to turn and fix the contact carrier in 90° positions.



Pin assignment

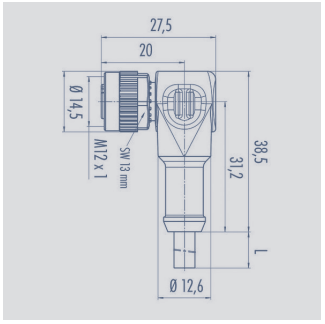


1 = brown
2 = white
3 = blue
4 = black

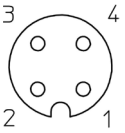
M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, not shielded, IP67, open ended

Connector housing	Plastic PA
Cable sheath	PUR; Ø = max. 6 mm, -40 °C...+85 °C (fixed)
Wires	PP, 0.34 mm²

Length	Type	P/N
2 m	EEM 33-35	400056135
5 m	EEM 33-36	400056136
10 m	EEM 33-37	400056137



Pin assignment



1 = brown
2 = white
3 = blue
4 = black

M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, not shielded, IP67, open ended

Connector housing	Plastic PA
Cable sheath	PUR; Ø = max. 6 mm, -40 °C...+85 °C (fixed)
Wires	PP, 0.34 mm²

Length	Type	P/N
2 m	EEM 33-38	400056138
5 m	EEM 33-39	400056139
10 m	EEM 33-40	400056140

IP67 Protection class IP67 to DIN EN 60529

IP68 Protection class IP68 to DIN EN 60529

CAN-bus

IO-Link

Very good Electromagnetic Compatibility (EMC) and shield systems

Very good resistance to oils, coolants und lubricants

UL - approved

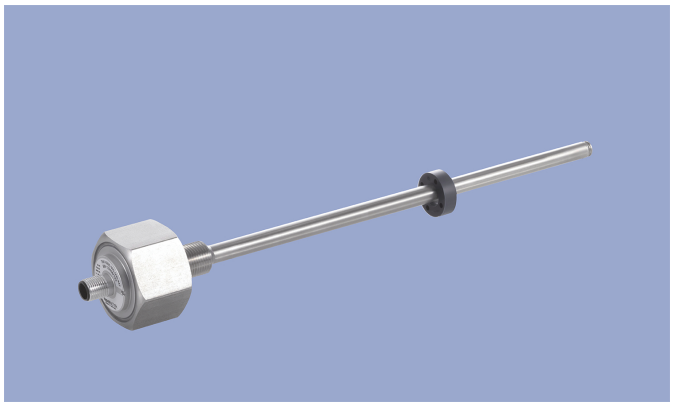
Suited for applications in dragchains

Note: The protection class is valid only in locked position with its plugs.
The application of these products in harsh environments must be checked in particular cases.

novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Screw flange
Voltage
Mobile Applications



Special Features
- For integration in pneumatic and hydraulic cylinders
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Ring-shaped position marker does not contact sensor
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in mobile applications with highest EMC requirements such as ISO pulses and high interferences to ISO 11452, exceeds E1 requirements
- Other configurations see separate data sheets

Applications
Hydraulic or pneumatic cylinders in
- Agricultural and forestry machinery
- Construction machines
- Vehicles with loading and unloading devices
- Vehicles with extension arms

The absolute position transducer can be used directly in-cylinder and thus enables a compact and cost-effective position measurement. The sensor consists of a stainless steel flange welded to a pressure tight rod and can therefore be used in harsh environments.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring NBR 90 SH A
Mounting	Screwed into cylinder via bushing M18x1.5 for screw plug hole per ISO 6149
Electrical connection	Connector M12x1, A-coded / Cable 3x 0.5 mm² (AWG 20), PUR, unshielded

Mechanical Data	
Dimensions	See dimension drawing

Ordering Specifications

Ordering Specifications

Preferred types printed in bold

Supply voltage Ub
8: Ub = 12/24 VDC, 24 VDC

Output signal
1: 0.1 ... 10 VDC
4: 0.5 ... 4.5 VDC
5: 0.25 ... 4.75 VDC

Output characteristic
1: Rising output characteristic, seen from flange
2: Falling output characteristic, seen from flange

Electrical connection
104: Connector M12x1, 4-pin
251: Cable, 3-pole, unshielded, A = 1 m
253: Cable, 3-pole, unshielded, A = 3 m
255: Cable, 3-pole, unshielded, A = 5 m

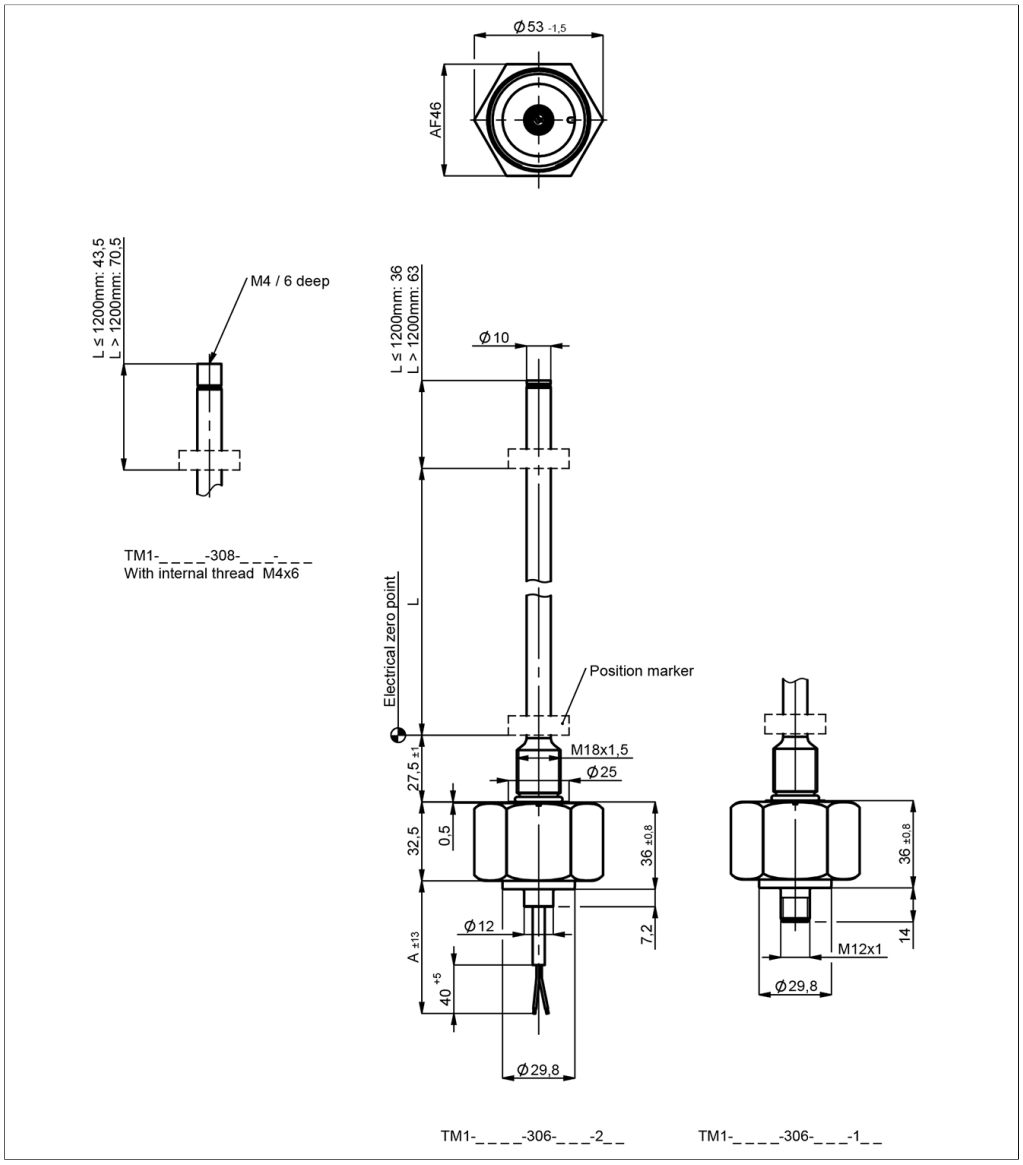
T	M	1	–	0	5	0	0	–	3	0	6	–	8	5	1	–	1	0	4

Mechanical version
306: Screw flange M18x1.5
308: Screw flange M18x1.5 with internal thread M4x6 at rod end, additional length 7.5 mm

Series

Electrical measuring range
Standard lengths 0050 up to 2000 mm in 25 mm-steps
Other lengths on request

Drawing


Ø53 -1,5
AF46
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-308-_ _ _-_ _ _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
Electrical zero point
L
Position marker
M18x1,5
Ø25
27,5 ±1
32,5
0,5
36 ±0,8
7,2
Ø12
A ±13
40 +5
Ø29,8
TM1-_ _ _ _-306-_ _ _-2_ _
TM1-_ _ _ _-306-_ _ _-1_ _
M12x1
14
Ø29,8

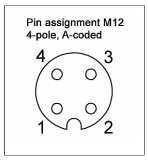
Technical Data

Type	**TM1-_ _ _ _-306-84_-_ _ _** **TM1-_ _ _ _-306-85_-_ _ _**	**TM1-_ _ _ _-306-81_-_ _ _**
Output signal	0.25 ... 4.75 V 0.5 ... 4.5 V	0.1 ... 10 V
Load	≥ 10 kΩ	
Sampling rate / Update rate	0.5 kHz	
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm	
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)	
Tolerance of electr. zero point	±1 mm	
Resolution	≤ 0.1 mm	
Repeatability	≤ ±0.1 mm	
Hysteresis	≤ ±0.1 mm	
Temperature error	typ. 50 ppm/K (min. 0.01 mm/K)	
Supply voltage Ub	12/24 VDC (8 ... 32 VDC)	24 VDC (16 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub	
Power drain w/o load	< 1 W	
Overvoltage protection	36 VDC (permanent)	
Polarity protection	yes (-36 VDC)	
Short circuit protection	yes (output vs GND and supply voltage up to 36 VDC)	
Insulation resistance (500 VDC)	≥ 10 MΩ	
Environmental Data		
Max. operational speed	Mechanically unlimited	
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm	
Shock IEC 60068-2-27	100 g, 11 ms (single hit)	
Protection class DIN EN 60529	IP67	
Operating temperature	-40 ... +105°C	
Operating humidity	0 ... 95 % R.H. (no condensation)	
Working pressure	≤ 350 bar	
Pressure peaks	≤ 450 bar	
Burst pressure	> 700 bar	
Life	Mechanically unlimited	
Functional safety	If you need assistance in using our products in safety-related systems, please contact us	
MTTF (IEC 60050)	346 years	346 years
EMC Compatibility		
ISO 10605 ESD (Handling/Component)	8 kV / 15 kV	
ISO 11452-2 Radiated HF-fields	100 V/m	
ISO 11452-4 BCI (Bulk current injection)	200 mA	
CISPR 25 Radiated emission	Level 4	
ISO 7637-2 Transient Emissions	Level 1/2	
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b) Level 4	
ISO 7637-3 Pulses on output lines	(3a, 3b) Fast Level 2	
ISO 16750 Pulses on supply lines	Starting profile Level 4 @12 V / Level 3 @24 V, Load dump A +200 V	
EN 13309 Construction machinery		
ISO 14982 Agricult./forestry machines		
Emission/Immunity	Exceeds E1 requirements	
	The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.	

FS = Full scale: Signal span according to electrical measuring range

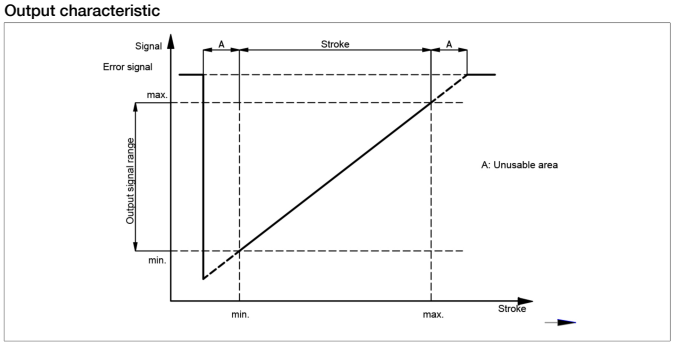
Connection Assignment

Signal	Connector code 1_ _	Cable code 2_ _
Supply voltage Ub	Pin 1	BN
GND	Pin 3	WH
Signal output	Pin 2	GN
Do not connect	Pin 4	-

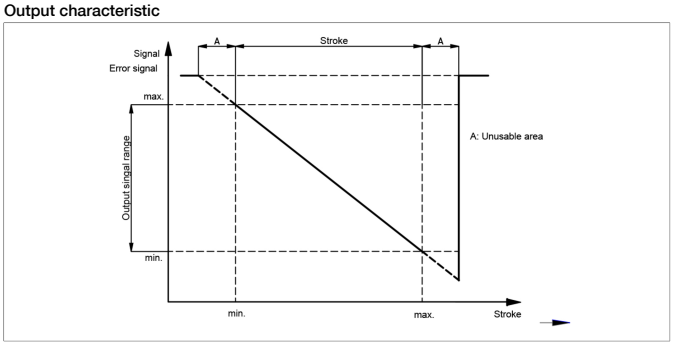


Technical Data
Output Characteristics

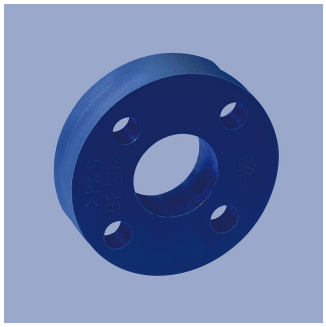
Output characteristic

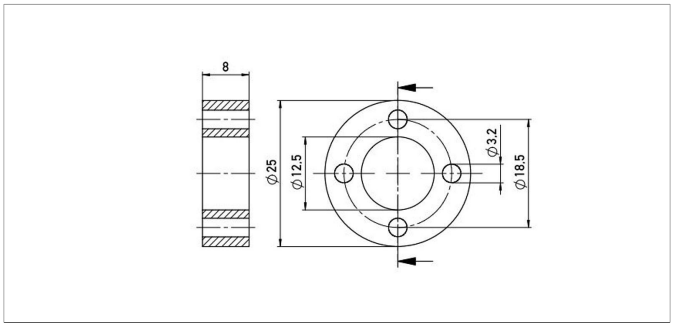


Output characteristic



Position Markers



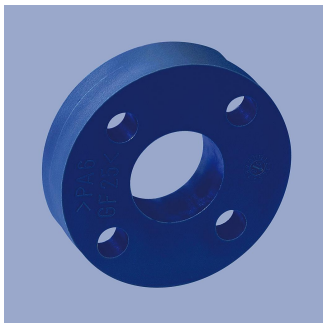


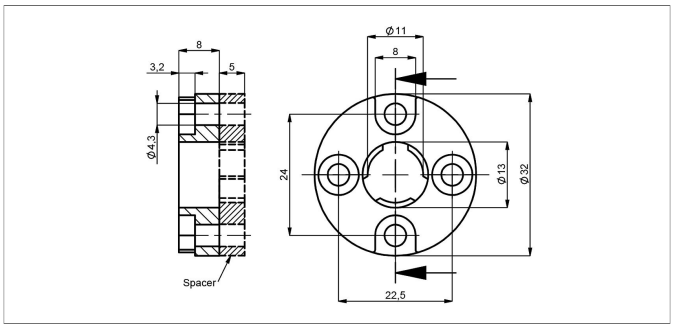
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





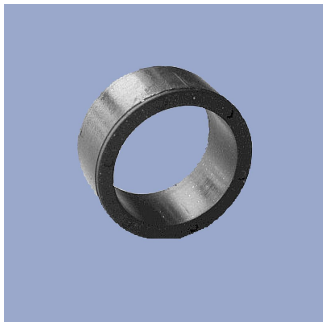
Z-TH1-P19

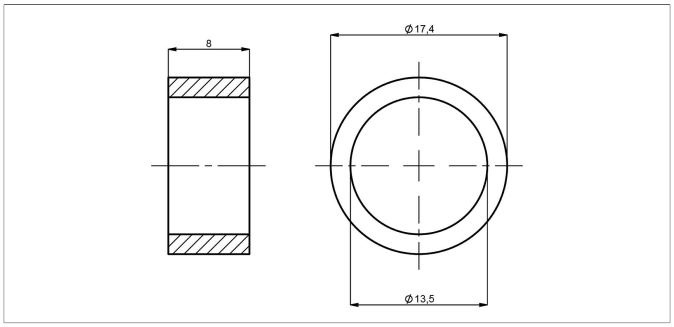
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



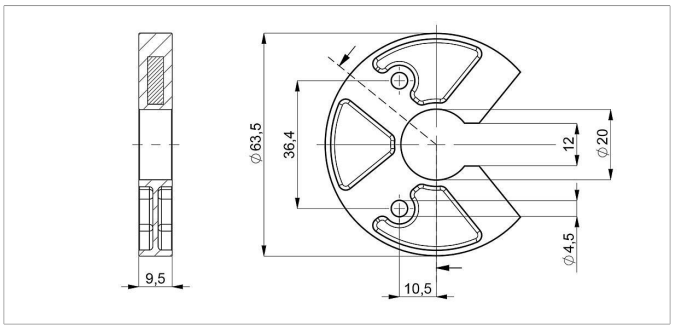


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

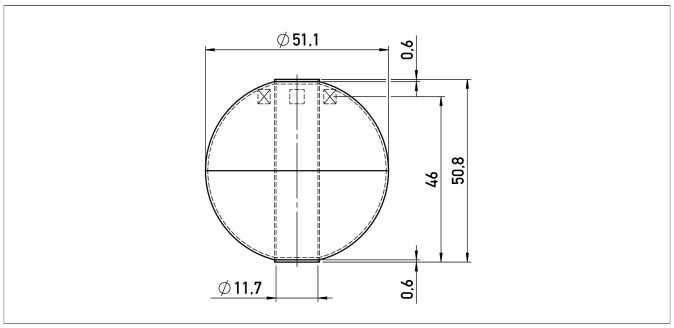
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

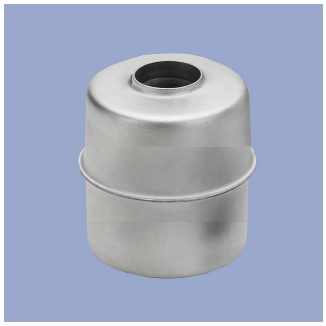
Position Markers

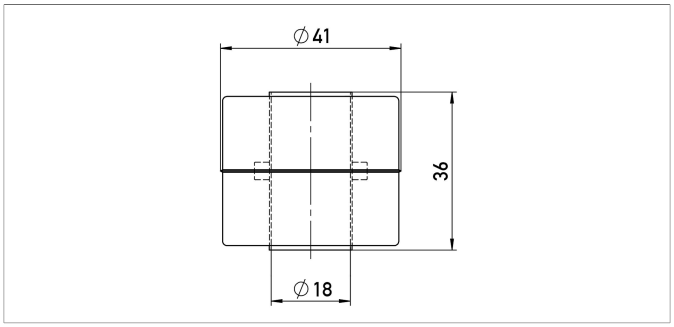


Z-TH1-P32
Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1

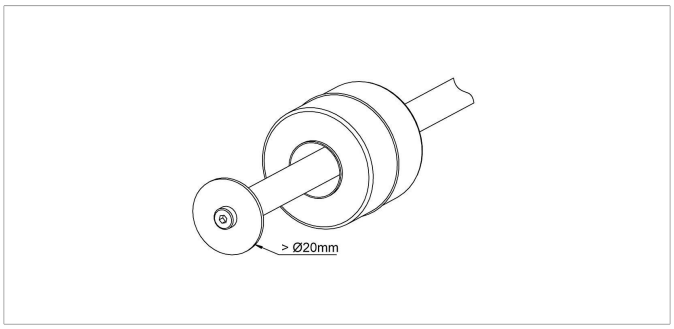




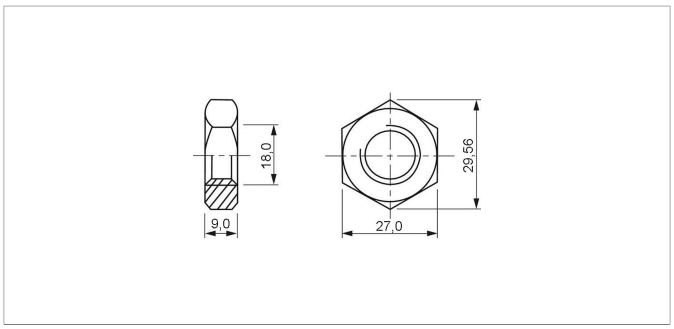
Z-TH1-P21
Cylinder floating position marker

Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

P/N	Pack. unit [pcs]
400056044	1



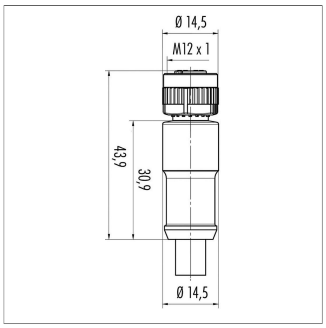
When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

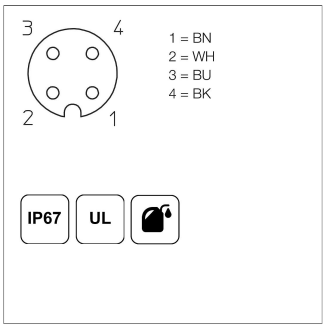


Z-TH1-M01
Lock nut ISO 8675, M18x1.5-A2

P/N	Pack. unit [pcs]
400056090	1

Connector System M12



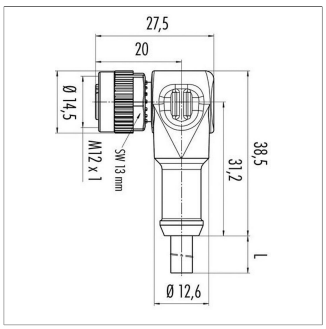


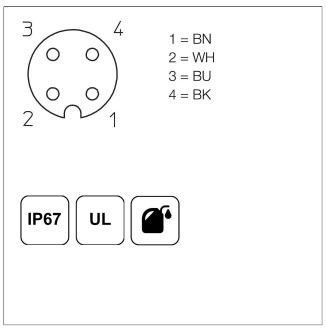
EEM-33-35/36/37

M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, not shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -40 ... +85°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400056135	EEM-33-35	2 m
400056136	EEM-33-36	5 m
400056137	EEM-33-37	10 m



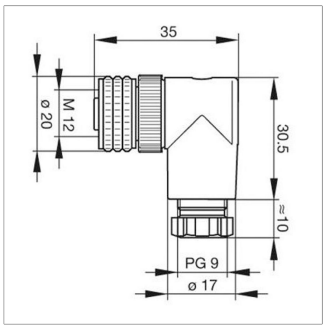


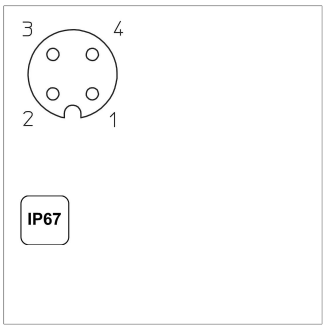
EEM-33-38/39/40

M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, not shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -40 ... +85°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400056138	EEM-33-38	2 m
400056139	EEM-33-39	5 m
400056140	EEM-33-40	10 m





EEM-33-89

M12x1 Mating female connector, 4-pin, angled, A-coded, with coupling nut, screw termination, IP67, not shieldable

Operating temp.	-25 ... +90°C
Plug housing	PBT
For wire gauge	6 ... 8 mm, max. 0.75 mm²

P/N	Type
400005634	EEM-33-89

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

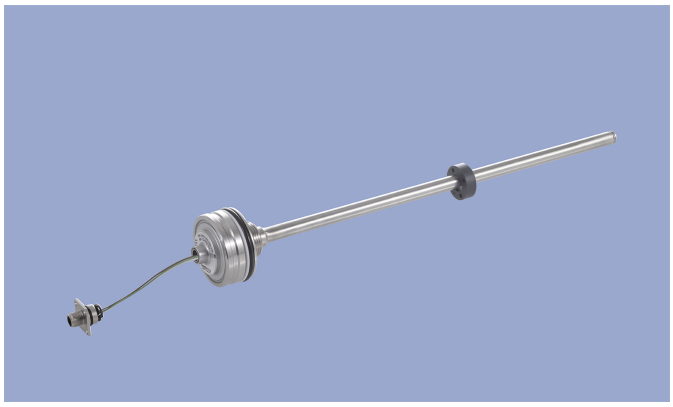
UL UL - approved

CAN CAN-Bus

novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Plug-in Flange
Voltage
Mobile Applications



Special Features
- For integration in pneumatic and hydraulic cylinders
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Ring-shaped position marker does not contact sensor
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in mobile applications with highest EMC requirements such as ISO pulses and high interferences to ISO 11452, exceeds E1 requirements
- Other configurations see separate data sheets

Applications
Hydraulic or pneumatic cylinders in
- Agricultural and forestry machinery
- Construction machines
- Vehicles with loading and unloading devices
- Vehicles with extension arms

The absolute position transducer can be used directly in-cylinder and thus enables a compact and cost-effective position measurement. The sensor consists of a stainless steel flange welded to a pressure tight rod and can therefore be used in harsh environments.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring FKM 80, Supporting ring: PTFE
Mounting	Plugged into cylinders, secured in position with set screw M5 ISO 4026
Electrical connection	Connector M12x1, A-coded / Cable 3x 0.5 mm² (AWG 20), PUR, unshielded / Connector system M12x1, A-coded with lead wires

Mechanical Data	
Dimensions	See dimension drawing

Ordering Specifications

Ordering Specifications

Preferred types printed in bold

Supply voltage Ub
8: Ub = 12/24 VDC, 24VDC

Output signal
1: 0.1 ... 10 VDC
4: 0.5 ... 4.5 VDC
5: 0.25 ... 4.75 VDC

Output characteristic
1: Rising output characteristic, seen from flange
2: Falling output characteristic, seen from flange

Electrical connection
104: Connector M12x1, 4-pin
251: Cable, 3-pole, unshielded, A = 1 m
253: Cable, 3-pole, unshielded, A = 3 m
255: Cable, 3-pole, unshielded, A = 5 m
438: Plug system M12x1, 4-pin, with lead wires 80 mm
442: Plug system M12x1, 4-pin, with lead wires 120 mm
446: Plug system M12x1, 4-pin, with lead wires 160 mm
450: Plug system M12x1, 4-pin, with lead wires 200 mm
454: Plug system M12x1, 4-pin, with lead wires 240 mm

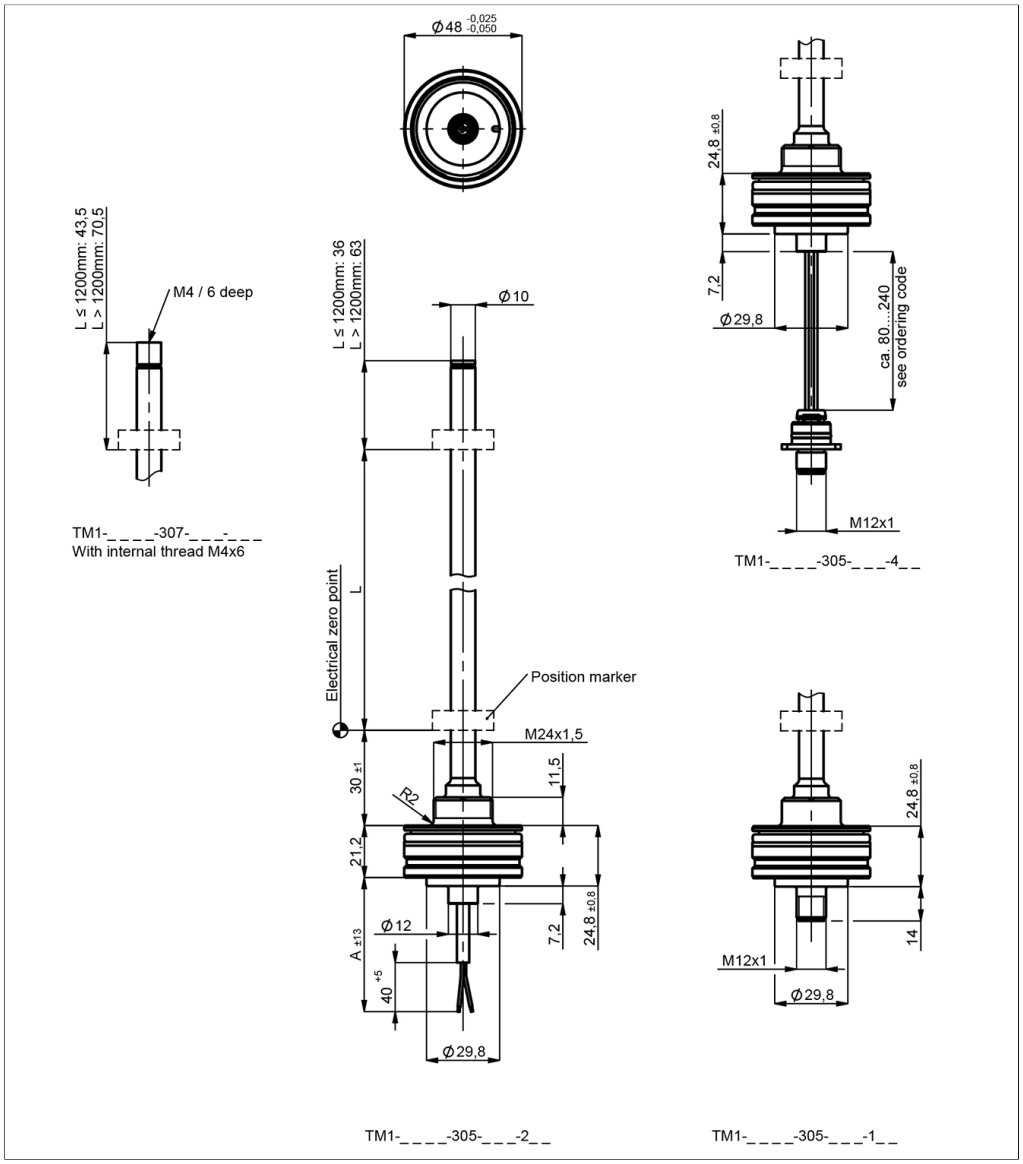
T M 1 – 0 5 0 0 – 3 0 5 – 8 5 1 – 4 4 2

Mechanical version
305: Plug-in flange Ø 48 mm
307: Plug-in flange Ø 48 mm with internal thread M4x6 at rod end, additional length 7.5 mm

Series

Electrical measuring range
Standard lengths 0050 up to 2000 mm in 25 mm-steps
Other lengths on request

Drawing


Ø48 -0,025 -0,050
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-307-_ _ _-_ _ _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
Electrical zero point
L
Position marker
M24x1,5
30 ±1
R2
11,5
21,2
A ±13
Ø12
7,2
24,8 ±0,8
40 +5
Ø29,8
TM1-_ _ _ _-305-_ _ _-2_ _
24,8 ±0,8
7,2
Ø29,8
ca. 80...240
see ordering code
M12x1
TM1-_ _ _ _-305-_ _ _-4_ _
24,8 ±0,8
14
M12x1
Ø29,8
TM1-_ _ _ _-305-_ _ _-1_ _

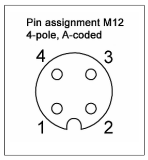
Technical Data

Type	**TM1-_ _ _ _-305-84 _-_ _ _** **TM1-_ _ _ _-305-85 _-_ _ _**	**TM1-_ _ _ _-305-81_-_ _ _**
Output signal	0.25 ... 4.75 V 0.5 ... 4.5 V	0.1 ... 10 V
Load	≥ 10 kΩ	
Sampling rate / Update rate	0.5 kHz	
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm	
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)	
Tolerance of electr. zero point	±1 mm	
Resolution	≤ 0.1 mm	
Repeatability	≤ ±0.1 mm	
Hysteresis	≤ ±0.1 mm	
Temperature error	typ. 50 ppm/K (min. 0.01 mm/K)	
Supply voltage Ub	12/24 VDC (8 ... 32 VDC)	24 VDC (16 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub	
Power drain w/o load	< 1 W	
Overvoltage protection	36 VDC (permanent)	
Polarity protection	yes (-36 VDC)	
Short circuit protection	yes (output vs GND and supply voltage up to 36 VDC)	
Insulation resistance (500 VDC)	≥ 10 MΩ	
Environmental Data		
Max. operational speed	Mechanically unlimited	
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm	
Shock IEC 60068-2-27	100 g, 11 ms (single hit)	
Protection class DIN EN 60529	IP67 (Connector system M12, fastened, when correctly fitted in cylinder: IP69)	
Operating temperature	-40 ... +105°C (connector M12 / cable), -40 ... +85°C (connector system M12)	
Operating humidity	0 ... 95 % R.H. (no condensation)	
Working pressure	≤ 350 bar	
Pressure peaks	≤ 450 bar	
Burst pressure	> 700 bar	
Life	Mechanically unlimited	
Functional safety	If you need assistance in using our products in safety-related systems, please contact us	
MTTF (IEC 60050)	346 years	346 years
EMC Compatibility		
ISO 10605 ESD (Handling/Component)	8 kV / 15 kV	
ISO 11452-2 Radiated HF-fields	100 V/m	
ISO 11452-4 BCI (Bulk current injection)	200 mA	
CISPR 25 Radiated emission	Level 4	
ISO 7637-2 Transient Emissions	Level 1/2	
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b) Level 4	
ISO 7637-3 Pulses on output lines	(3a, 3b) Fast Level 2	
ISO 16750 Pulses on supply lines	Starting profile Level 4 @12 V / Level 3 @24 V, Load dump A +200 V	
EN 13309 Construction machinery		
ISO 14982 Agricult./forestry machines		
Emission/Immunity	Exceeds E1 requirements	
	The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.	

FS = Full scale: Signal span according to electrical measuring range

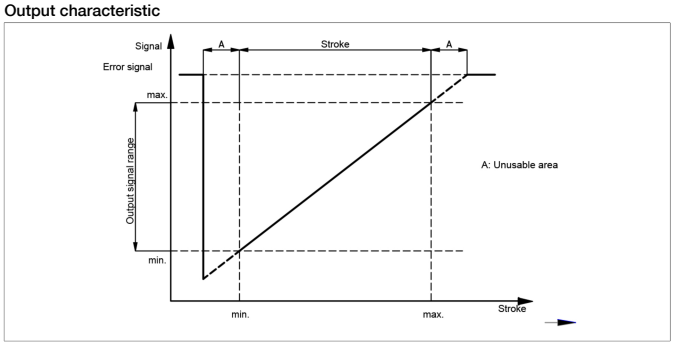
Connection Assignment

Signal	Connector code 1_ _	Cable code 2_ _	Plug system code 4_ _
Supply voltage Ub	Pin 1	BN	Pin 1
GND	Pin 3	WH	Pin 3
Signal output	Pin 2	GN	Pin 2
Do not connect	Pin 4	-	Pin 4

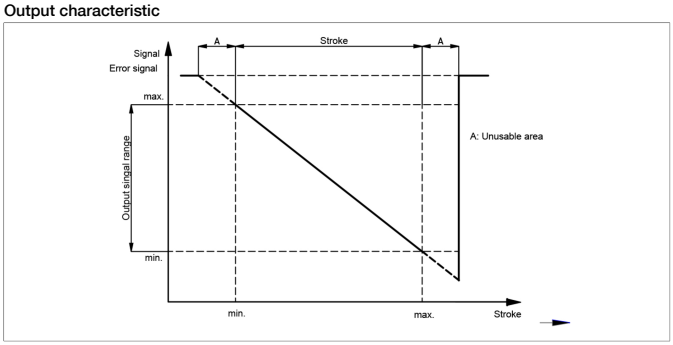


Technical Data
Output Characteristics

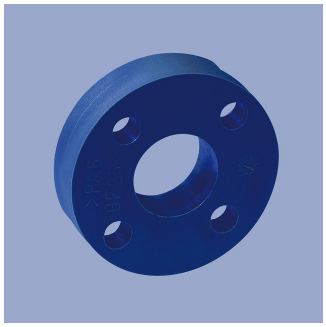
Output characteristic

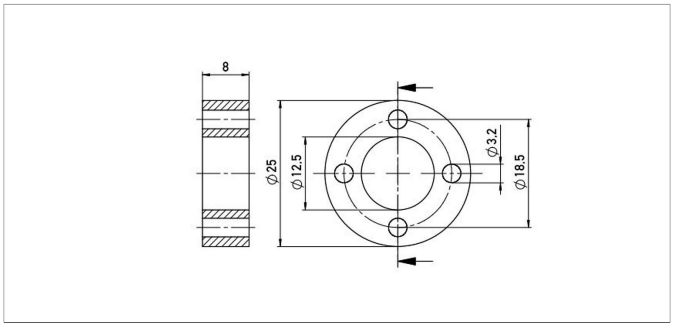


Output characteristic



Position Markers



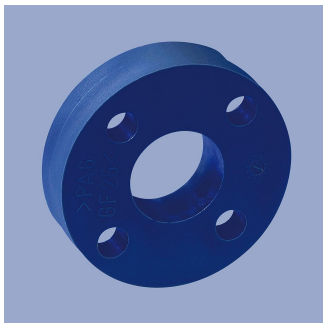


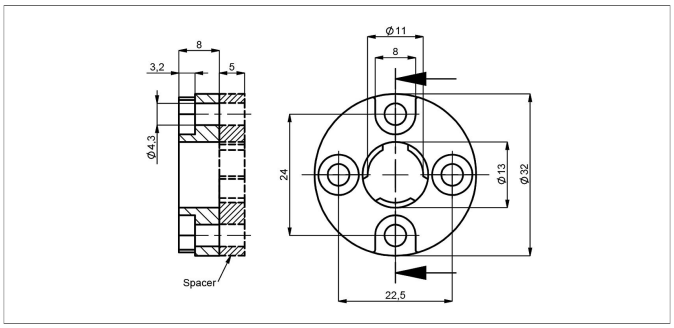
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





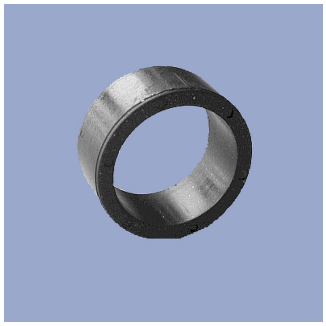
Z-TH1-P19

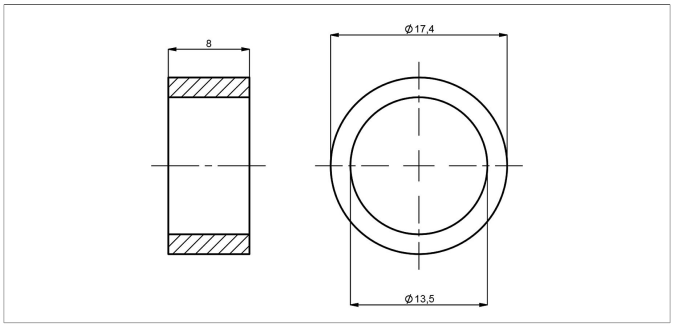
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



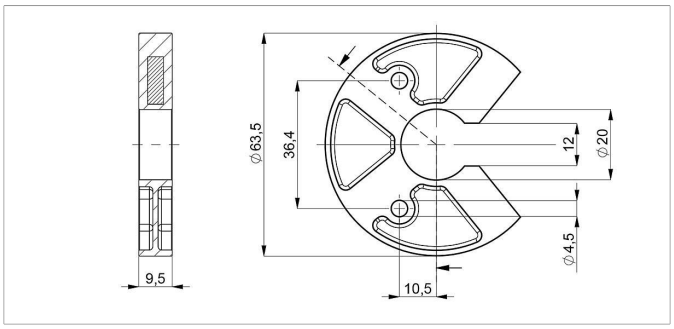


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

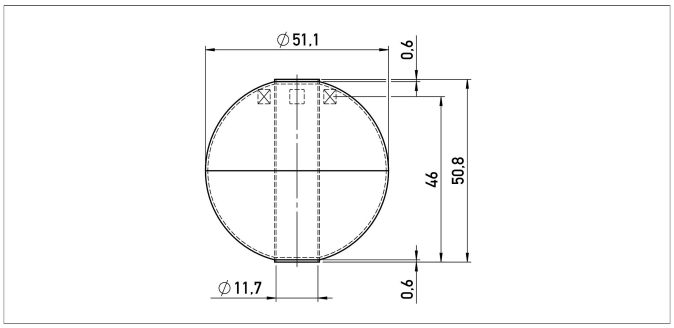
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

Position Markers

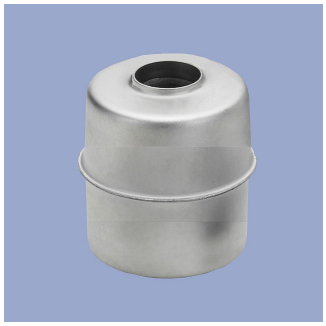


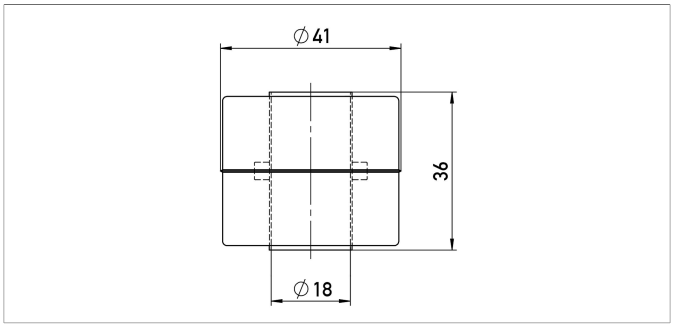
Z-TH1-P32

Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1



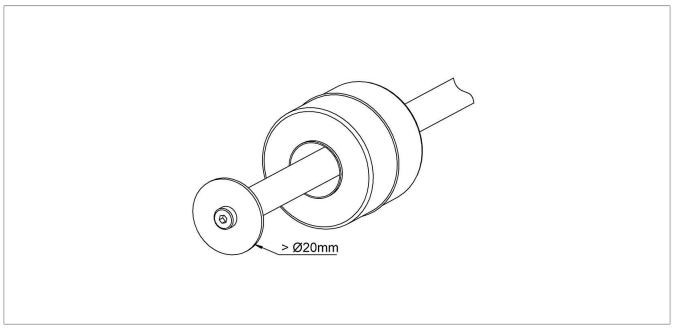


Z-TH1-P21

Cylinder floating position marker

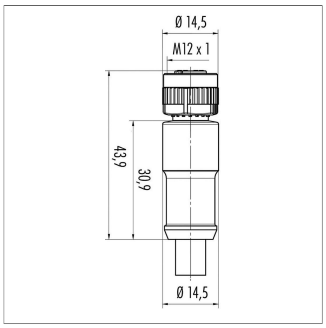
Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

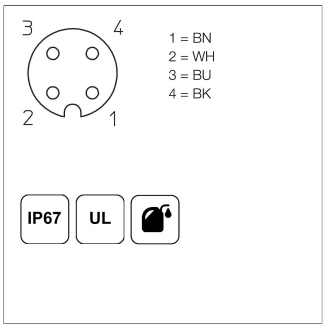
P/N	Pack. unit [pcs]
400056044	1



When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

Connector System M12



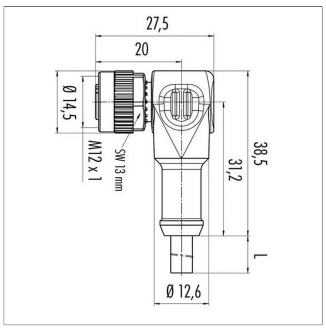


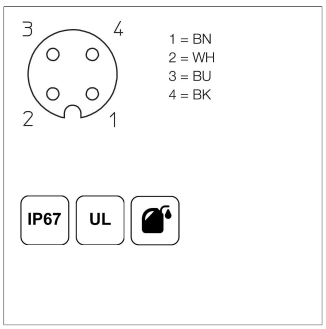
EEM-33-35/36/37

M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, not shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -40 ... +85°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400056135	EEM-33-35	2 m
400056136	EEM-33-36	5 m
400056137	EEM-33-37	10 m



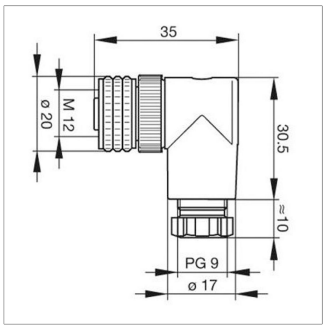


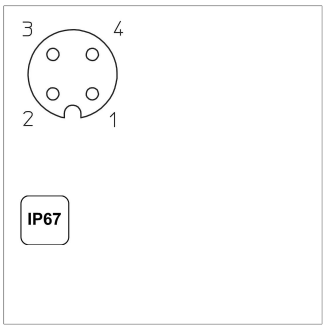
EEM-33-38/39/40

M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, not shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -40 ... +85°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400056138	EEM-33-38	2 m
400056139	EEM-33-39	5 m
400056140	EEM-33-40	10 m





EEM-33-89

M12x1 Mating female connector, 4-pin, angled, A-coded, with coupling nut, screw termination, IP67, not shieldable

Operating temp.	-25 ... +90°C
Plug housing	PBT
For wire gauge	6 ... 8 mm, max. 0.75 mm²

P/N	Type
400005634	EEM-33-89

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

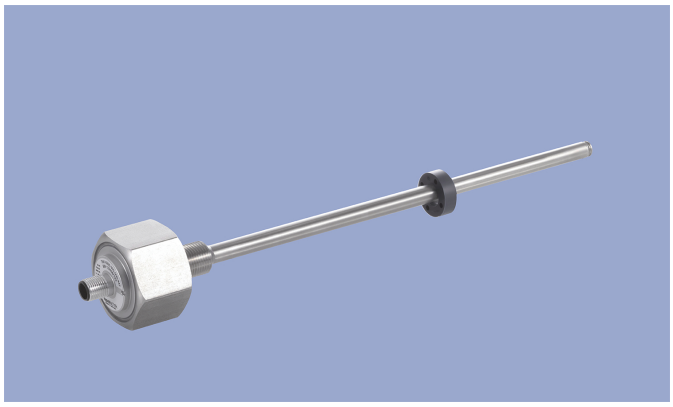
UL UL - approved

CAN CAN-Bus

novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Screw flange
CAN SAE J1939
Mobile Applications



Special Features
- For integration in pneumatic and hydraulic cylinders
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Ring-shaped position marker does not contact sensor
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in mobile applications with highest EMC requirements such as ISO pulses and high interferences to ISO 11452, exceeds E1 requirements
- Other configurations see separate data sheets

Applications
Hydraulic or pneumatic cylinders in
- Agricultural and forestry machinery
- Construction machines
- Vehicles with loading and unloading devices
- Vehicles with extension arms

The absolute position transducer can be used directly in-cylinder and thus enables a compact and cost-effective position measurement. The sensor consists of a stainless steel flange welded to a pressure tight rod and can therefore be used in harsh environments.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

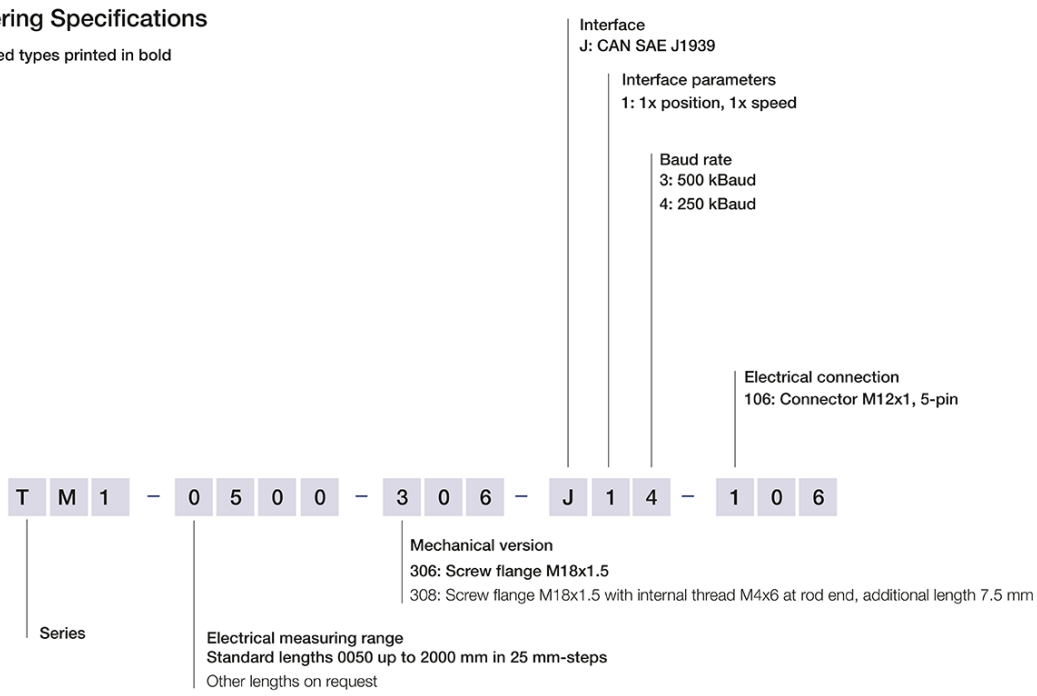
Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring NBR 90 SH A
Mounting	Screwed into cylinder via bushing M18x1.5 for screw plug hole per ISO 6149
Electrical connection	Connector M12x1, A-coded

Mechanical Data	
Dimensions	See dimension drawing

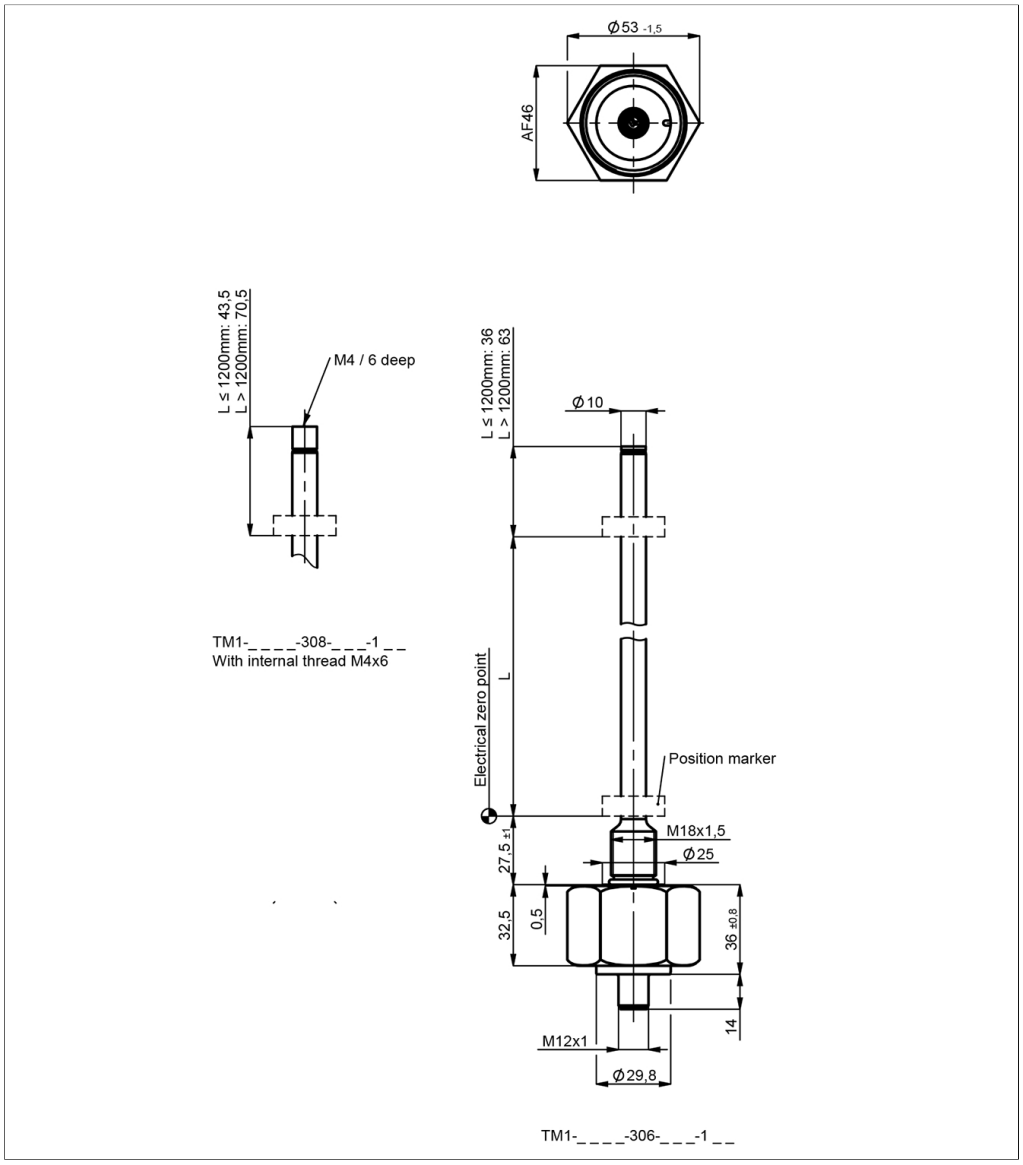
Ordering Specifications

Ordering Specifications

Preferred types printed in bold



Drawing


Ø53 -1,5
AF46
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-308-_ _ _-1 _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
L
Electrical zero point
Position marker
M18x1,5
Ø25
27,5 ±1
32,5
0,5
36 ±0,8
14
M12x1
Ø29,8
TM1-_ _ _ _-306-_ _ _-1 _ _

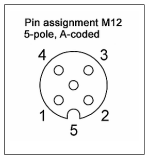
Technical Data

Type	**TM1-_ _ _ _-306-J_ _-106** **CAN SAE J1939**
Measured variables	Position, speed and temperature
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm
Measuring range speed	25 ... 1000 mm/s
Protocol	CAN SAE J1939
Programmable parameters	Offset position, averaging, baud rate, transmit mode, transmit cycle, source address
Node ID	128 ... 247 (dynamic address claiming)
Baud rate	250, 500 kBaud
Update rate (output)	1 kHz (internal measuring rate 0.5 kHz)
Resolution position	≤ 0.1 mm
Resolution speed	2 mm/s
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)
Tolerance of electr. zero point	±1 mm
Repeatability	≤ ±0.1 mm
Hysteresis	≤ ±0.1 mm
Temperature error	≤ ±15 ppm/K (min. 0.01 mm/K)
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub
Power drain w/o load	< 1.5 W
Overvoltage protection	40 VDC (6 s)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (all outputs vs. GND and supply voltage)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	w/o (internal load resistance 120 Ω on request)
Environmental Data	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67
Operating temperature	-40 ... +105°C
Operating humidity	0 ... 95 % R.H. (no condensation)
Working pressure	≤ 350 bar
Pressure peaks	≤ 450 bar
Burst pressure	> 700 bar
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	391 years
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
EMC Compatibility	
ISO 10605 ESD (Handling/Component)	8 kV / 15 kV
ISO 11452-2 Radiated HF-fields	100 V/m
ISO 11452-4 BCI (Bulk current injection)	200 mA
CISPR 25 Radiated emission	Level 4
ISO 7637-2 Transient Emissions	Level 1/2
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b) Level 4
ISO 7637-3 Pulses on output lines	(3a, 3b) Fast Level 2
ISO 16750 Pulses on supply lines	Starting profile Level 4 @12 V / Level 3 @24 V, Load dump A +200 V
EN 13309 Construction machinery	
ISO 14982 Agricult./forestry machines	
Emission/Immunity	Exceeds E1 requirements
	The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.

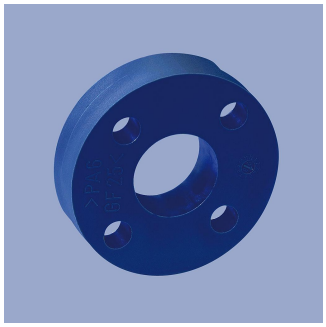
FS = Full scale: Signal span according to electrical measuring range

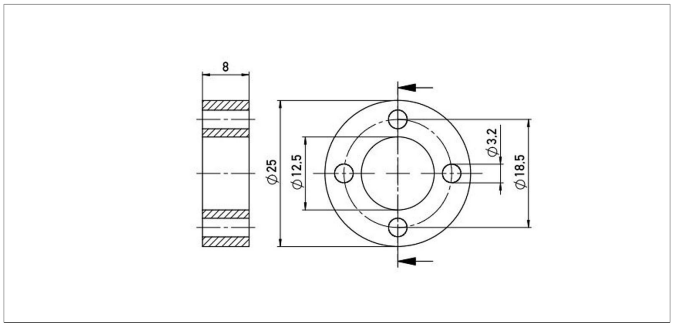
Connection Assignment

Signal	Connector code 106
Supply voltage Ub	Pin 2
GND	Pin 3
CAN_H	Pin 4
CAN_L	Pin 5
Not assigned	Pin 1



Position Markers



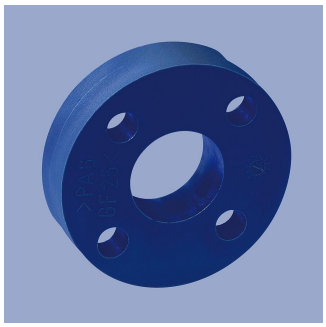


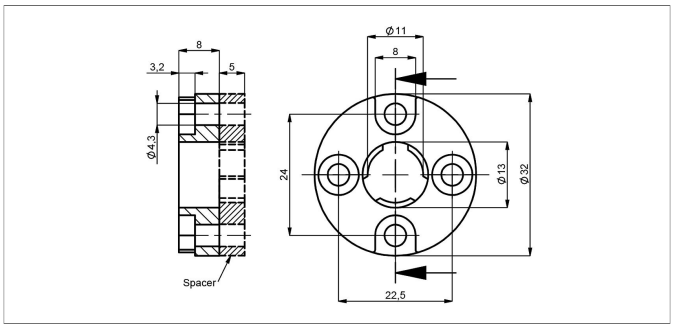
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





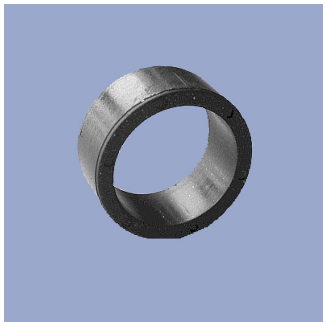
Z-TH1-P19

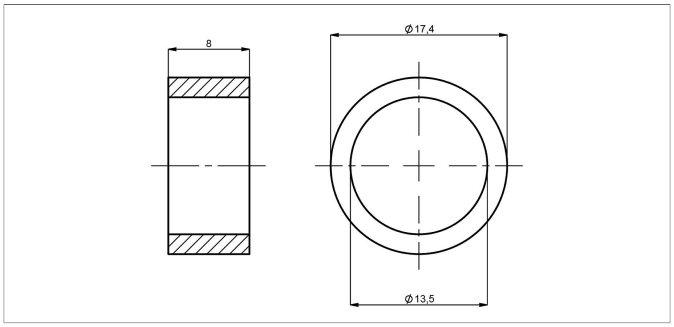
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



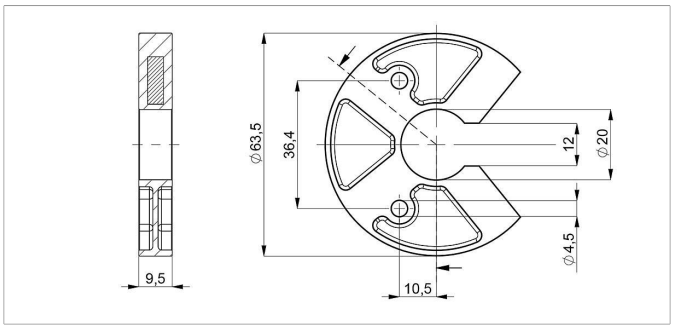


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

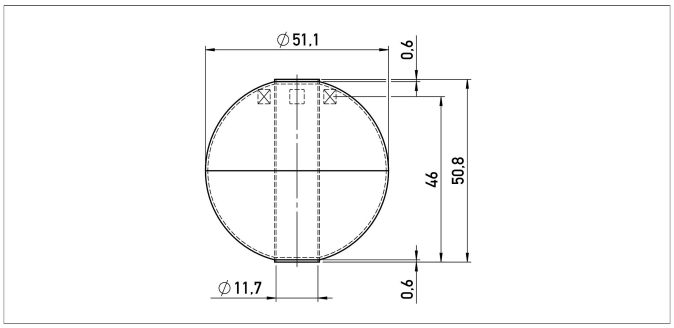
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

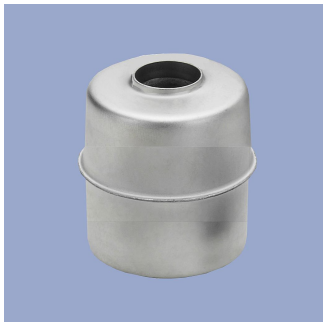
Position Markers

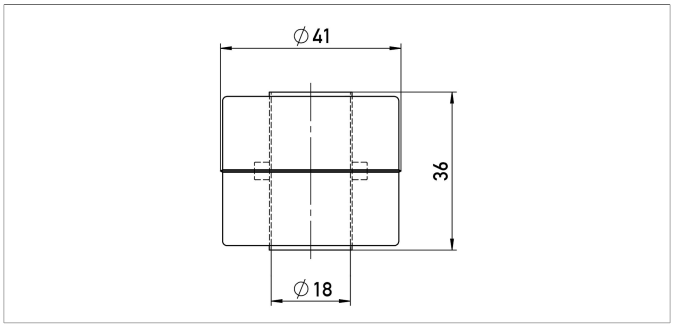


Z-TH1-P32
Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1

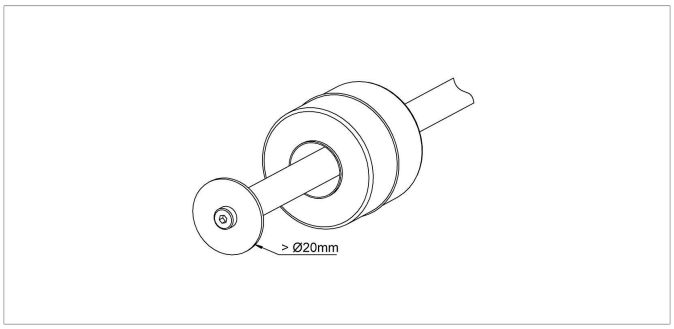




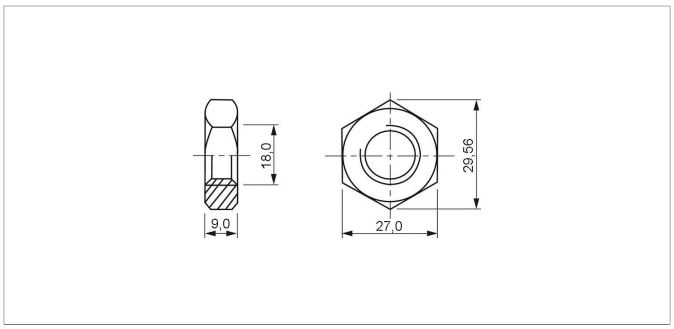
Z-TH1-P21
Cylinder floating position marker

Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

P/N	Pack. unit [pcs]
400056044	1



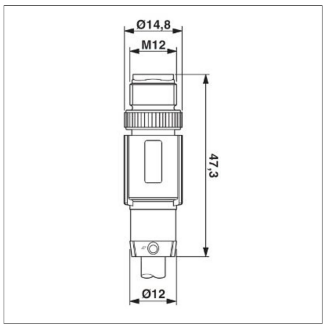
When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

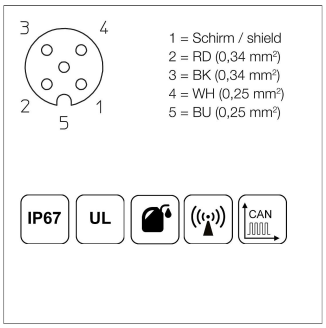


Z-TH1-M01
Lock nut ISO 8675, M18x1.5-A2

P/N	Pack. unit [pcs]
400056090	1

Connector System M12

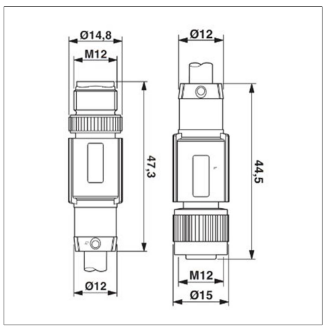


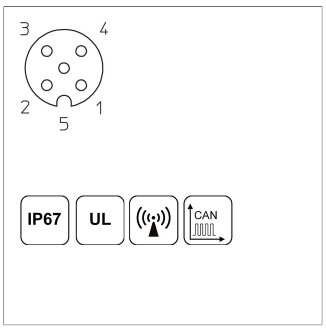


EEM-33-49/50/51
M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), open ended

Plug housing	TPU
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106368	EEM-33-49	2 m
400106371	EEM-33-50	5 m
400106372	EEM-33-51	10 m

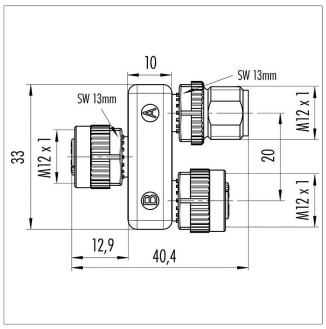


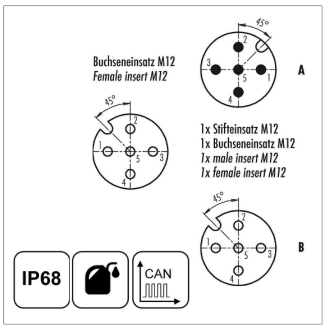


EEM-33-52
M12x1 Mating female/male connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), CAN-Bus

Plug housing	PUR
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (plug/socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106373	EEM-33-52	5 m

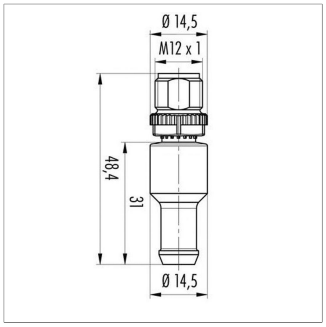


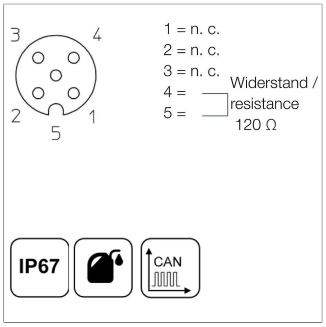


EEM-33-45
M12x1 splitter / T-connector, 5-pin, A-coded, IP68,1:1 connection, female - male - female, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056145	EEM-33-45





EEM-33-47
M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056147	EEM-33-47

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

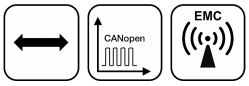
UL UL - approved

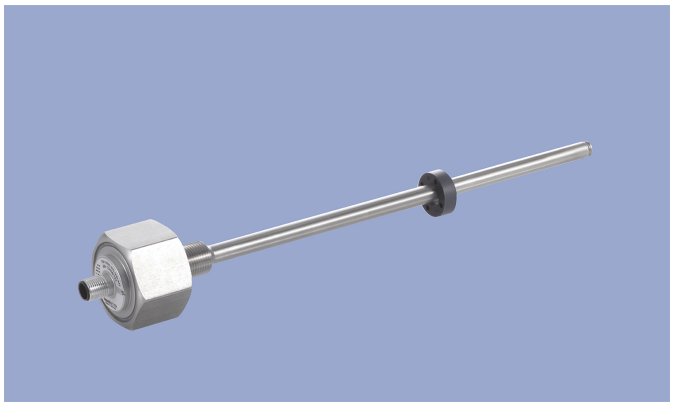
CAN CAN-Bus

novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Screw flange
CANopen
Mobile Applications





Special Features
- For integration in pneumatic and hydraulic cylinders
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Ring-shaped position marker does not contact sensor
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in mobile applications with highest EMC requirements such as ISO pulses and high interferences to ISO 11452, exceeds E1 requirements
- Other configurations see separate data sheets

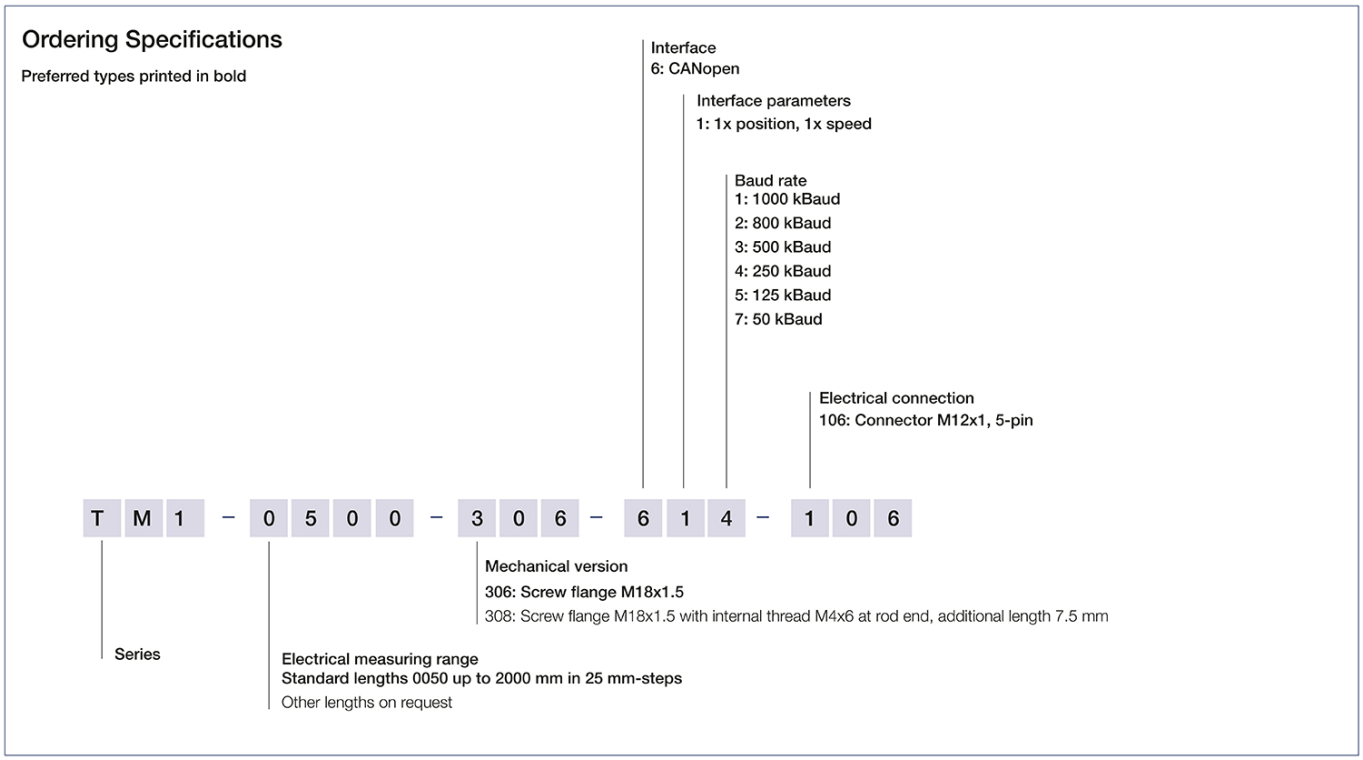
Applications
Hydraulic or pneumatic cylinders in
- Agricultural and forestry machinery
- Construction machines
- Vehicles with loading and unloading devices
- Vehicles with extension arms

The absolute position transducer can be used directly in-cylinder and thus enables a compact and cost-effective position measurement. The sensor consists of a stainless steel flange welded to a pressure tight rod and can therefore be used in harsh environments.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

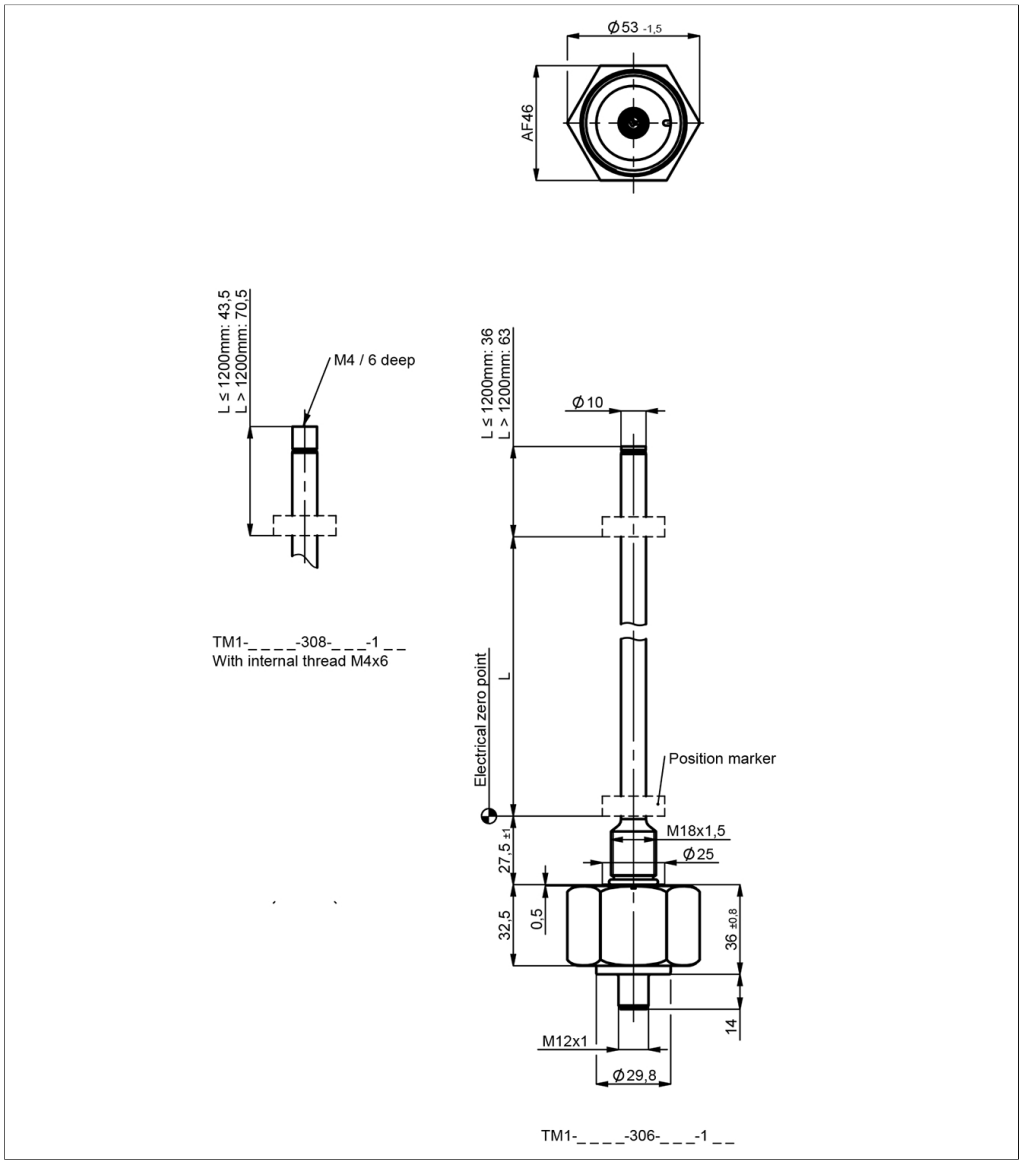
Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring NBR 90 SH A
Mounting	Screwed into cylinder via bushing M18x1.5 for screw plug hole per ISO 6149
Electrical connection	Connector M12x1, A-coded

Mechanical Data	
Dimensions	See dimension drawing

Ordering Specifications



Drawing


Ø53 -1,5
AF46
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-308-_ _ _-1 _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
L
Electrical zero point
Position marker
M18x1,5
Ø25
27,5 ±1
32,5
0,5
36 ±0,8
14
M12x1
Ø29,8
TM1-_ _ _ _-306-_ _ _-1 _ _

Technical Data

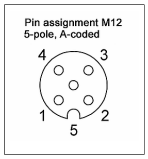
CANopen

Type	**TM1-_ _ _ _-306-6_ _-106**
	CANopen
Measured variables	Position, speed and temperature
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm
Measuring range speed	25 ... 1000 mm/s
Protocol	CANopen protocol to CiA DS-301 V4.2.0, Device profile DS-406 V3.2 Encoder Class C2, LSS services to CiA DS-305 V1.1.2
Programmable parameters	Position, speed, cams, working areas, temperature, node ID, baud rate
Node ID	1 ... 127 (default 127)
Baud rate	50 ... 1000 kBaud
Update rate (output)	1 kHz (internal measuring rate 0.5 kHz)
Resolution position	≤ 0.1 mm
Resolution speed	2 mm/s
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)
Tolerance of electr. zero point	±1 mm
Repeatability	≤ ±0.1 mm
Hysteresis	≤ ±0.1 mm
Temperature error	≤ ±15 ppm/K (min. 0.01 mm/K)
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub
Power drain w/o load	< 1.5 W
Overvoltage protection	40 VDC (6 s)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (all outputs vs. GND and supply voltage)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	w/o (internal load resistance 120 Ω on request)
Environmental Data	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67
Operating temperature	-40 ... +105°C
Operating humidity	0 ... 95 % R.H. (no condensation)
Working pressure	≤ 350 bar
Pressure peaks	≤ 450 bar
Burst pressure	> 700 bar
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	391 years
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
EMC Compatibility	
ISO 10605 ESD (Handling/Component)	8 kV / 15 kV
ISO 11452-2 Radiated HF-fields	100 V/m
ISO 11452-4 BCI (Bulk current injection)	200 mA
CISPR 25 Radiated emission	Level 4
ISO 7637-2 Transient Emissions	Level 1/2
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b) Level 4
ISO 7637-3 Pulses on output lines	(3a, 3b) Fast Level 2
ISO 16750 Pulses on supply lines	Starting profile Level 4 @12 V / Level 3 @24 V, Load dump A +200 V
EN 13309 Construction machinery	
ISO 14982 Agricult./forestry machines	
Emission/Immunity	Exceeds E1 requirements
	The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.

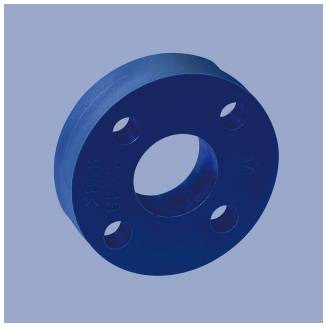
FS = Full scale: Signal span according to electrical measuring range

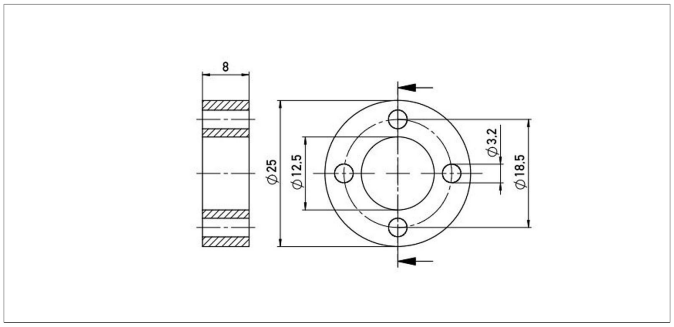
Connection Assignment

Signal	Connector code 106
Supply voltage Ub	Pin 2
GND	Pin 3
CAN_H	Pin 4
CAN_L	Pin 5
Not assigned	Pin 1



Position Markers



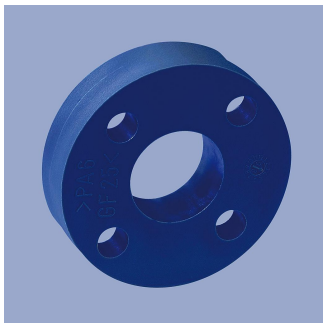


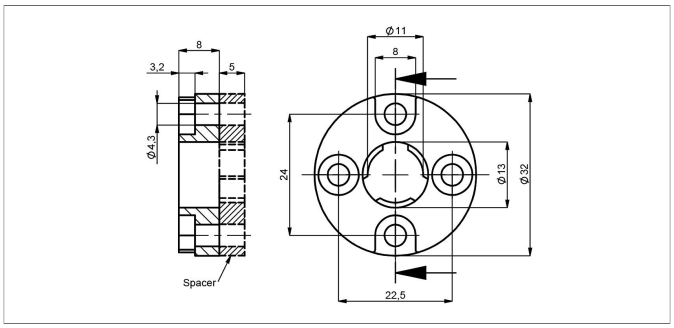
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





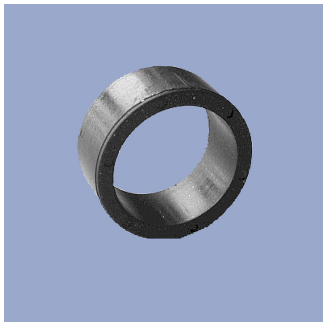
Z-TH1-P19

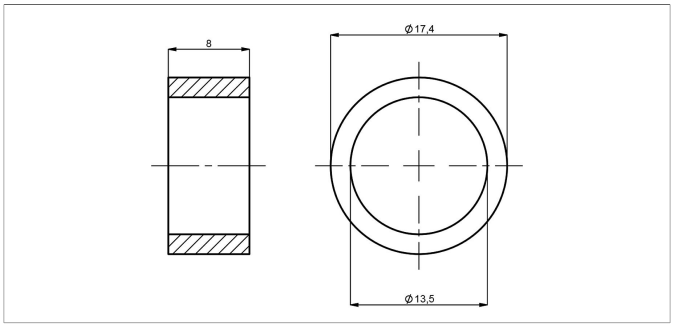
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



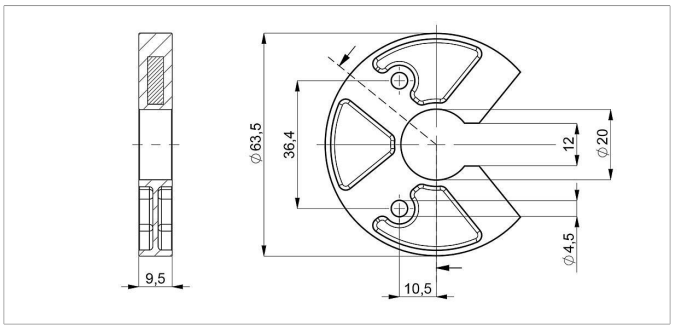


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

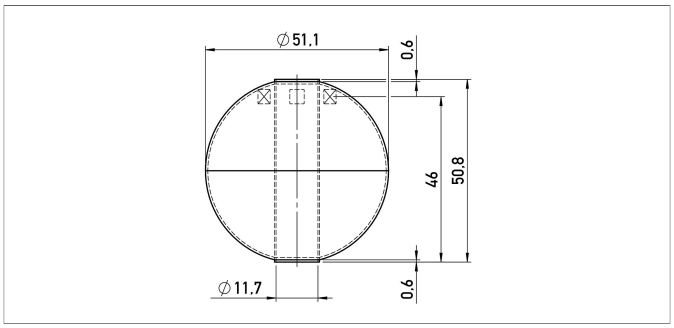
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

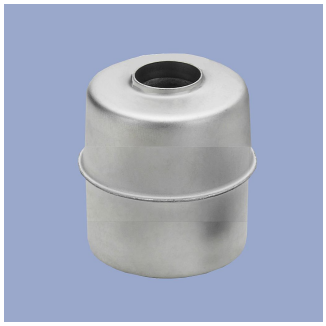
Position Markers

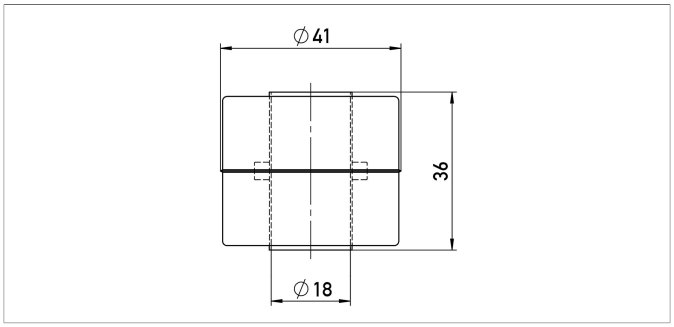


Z-TH1-P32
Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1

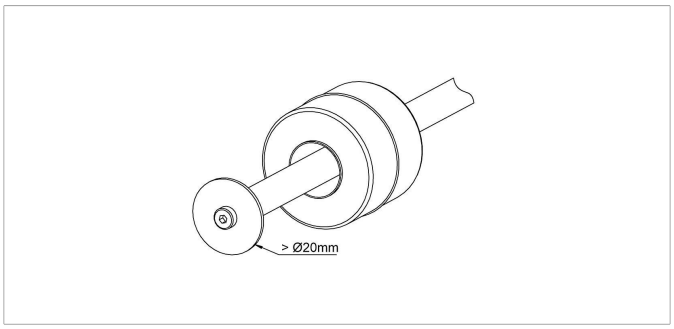




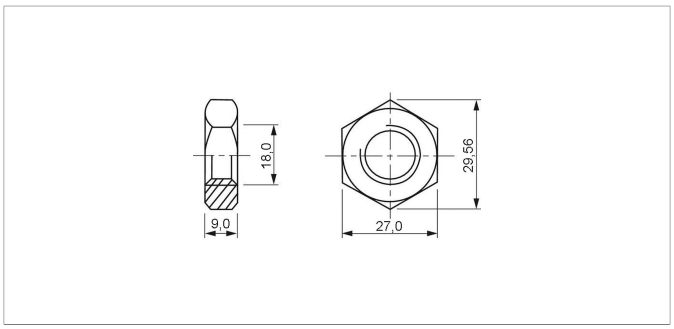
Z-TH1-P21
Cylinder floating position marker

Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

P/N	Pack. unit [pcs]
400056044	1



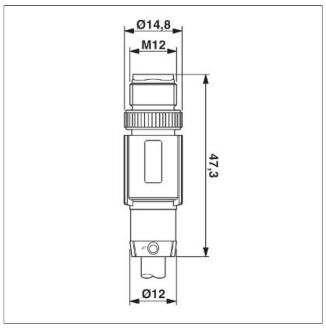
When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

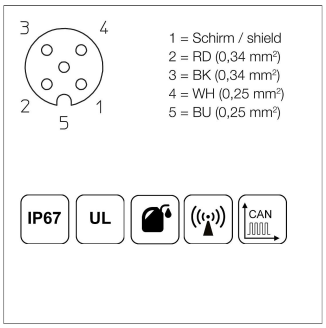


Z-TH1-M01
Lock nut ISO 8675, M18x1.5-A2

P/N	Pack. unit [pcs]
400056090	1

Connector System M12

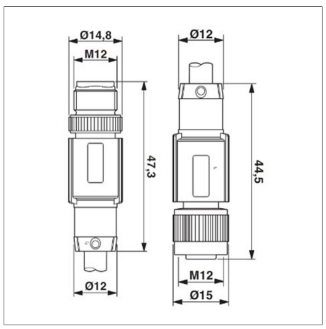


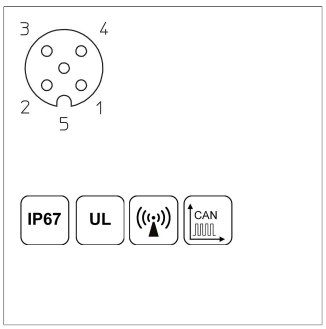


EEM-33-49/50/51
M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), open ended

Plug housing	TPU
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106368	EEM-33-49	2 m
400106371	EEM-33-50	5 m
400106372	EEM-33-51	10 m

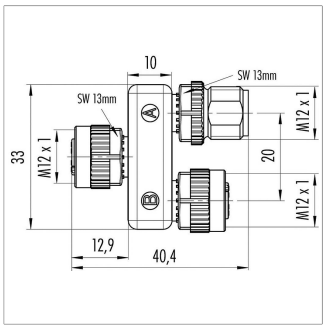


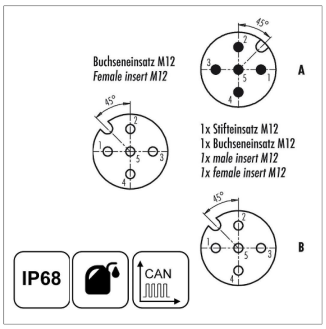


EEM-33-52
M12x1 Mating female/male connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), CAN-Bus

Plug housing	PUR
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (plug/socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106373	EEM-33-52	5 m

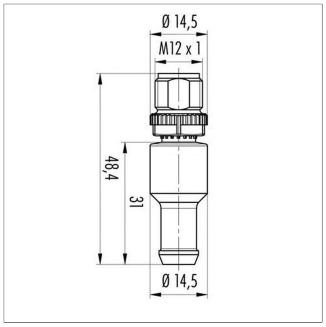


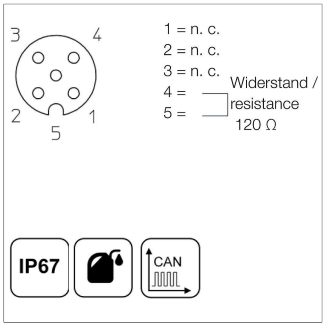


EEM-33-45
M12x1 splitter / T-connector, 5-pin, A-coded, IP68,1:1 connection, female - male - female, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056145	EEM-33-45





EEM-33-47
M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056147	EEM-33-47

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

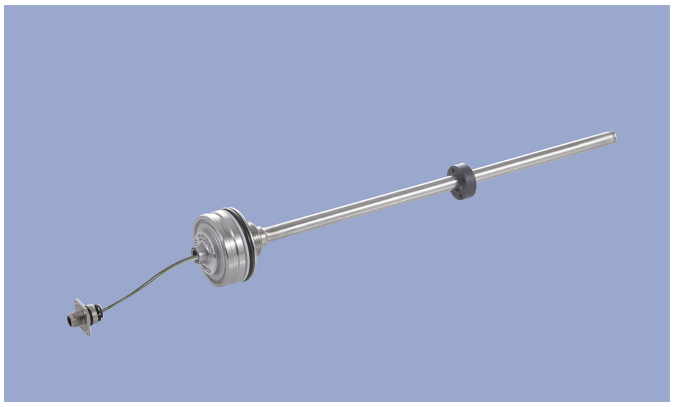
UL UL - approved

CAN CAN-Bus

novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Plug-in Flange
CAN SAE J1939
Mobile Applications



Special Features
- For integration in pneumatic and hydraulic cylinders
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Ring-shaped position marker does not contact sensor
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in mobile applications with highest EMC requirements such as ISO pulses and high interferences to ISO 11452, exceeds E1 requirements
- Other configurations see separate data sheets

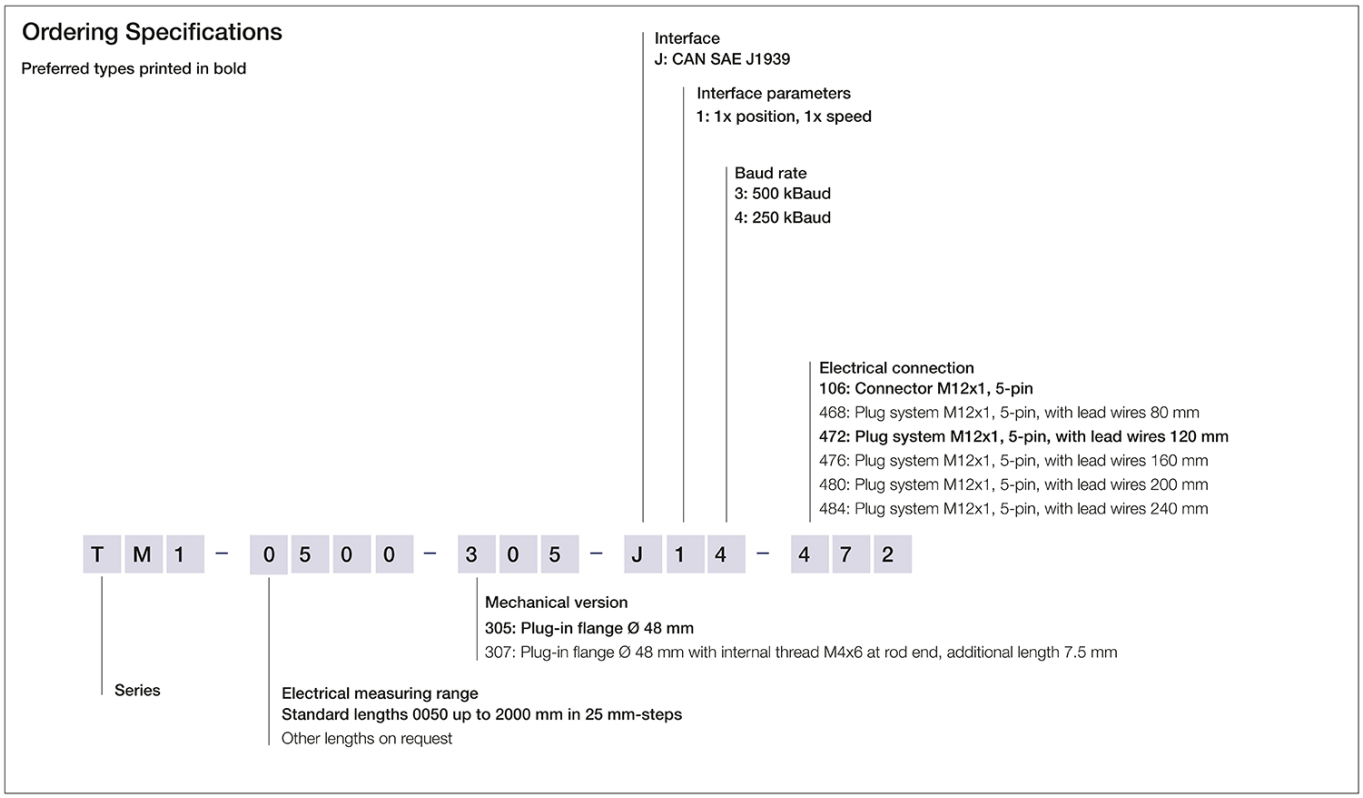
Applications
Hydraulic or pneumatic cylinders in
- Agricultural and forestry machinery
- Construction machines
- Vehicles with loading and unloading devices
- Vehicles with extension arms

The absolute position transducer can be used directly in-cylinder and thus enables a compact and cost-effective position measurement. The sensor consists of a stainless steel flange welded to a pressure tight rod and can therefore be used in harsh environments.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

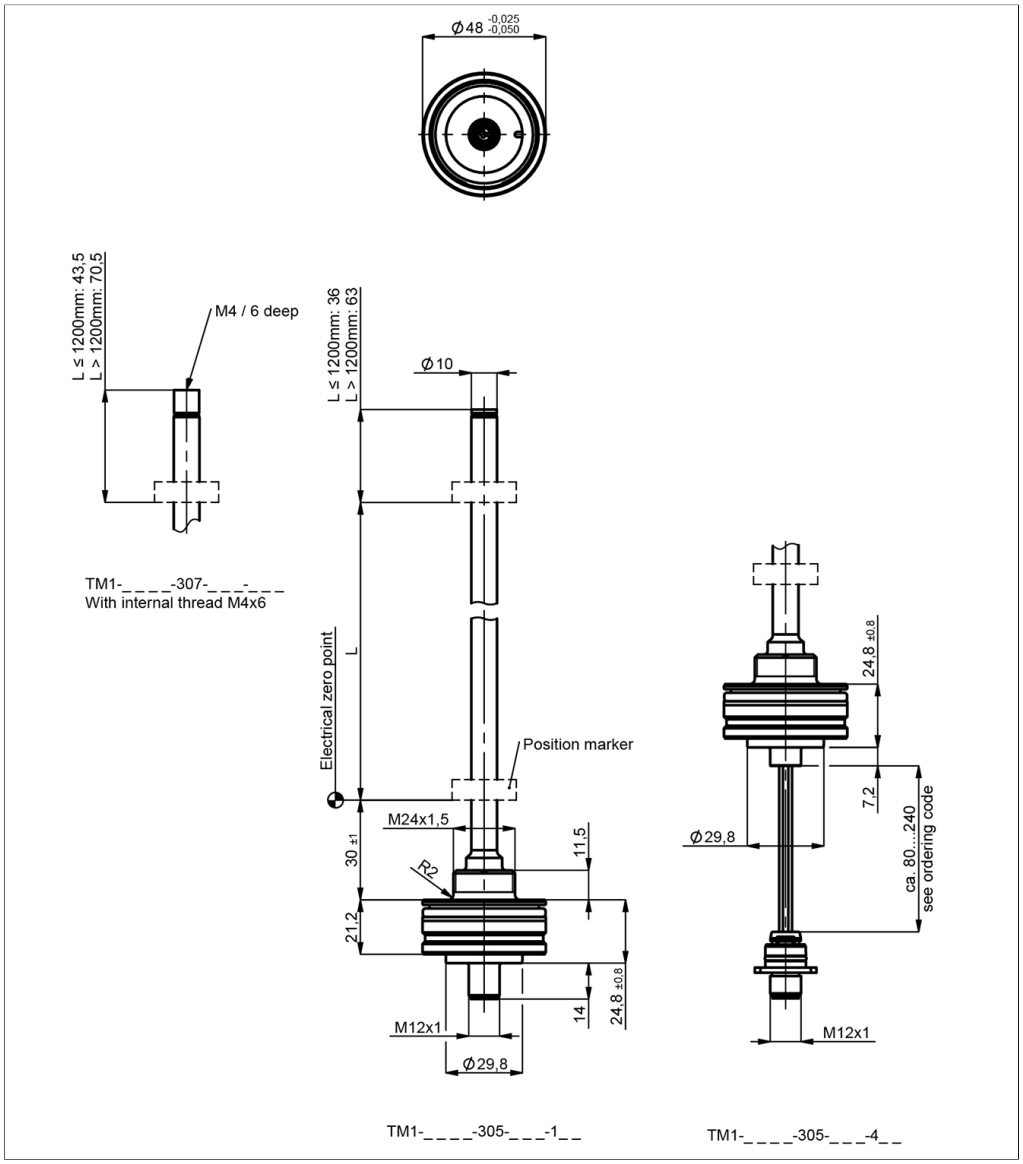
Description	
Material	Flange: stainless steel 1.4307 / AISI 304L
	Flange cover: AlSiMgBi
	Rod: stainless steel 1.4571 / AISI 316Ti
	Sealing: O-ring FKM 80, Supporting ring: PTFE
Mounting	Plugged into cylinders, secured in position with set screw M5 ISO 4026
Electrical connection	Connector M12x1, A-coded / Connector system M12x1, A-coded with lead wires

Mechanical Data	
Dimensions	See dimension drawing

Ordering Specifications



Drawing


Ø48 -0,025 -0,050
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-307-_ _ _-_ _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
Electrical zero point
L
Position marker
M24x1,5
30 ±1
R2
11,5
21,2
14
24,8 ±0,8
M12x1
Ø29,8
TM1-_ _ _ _-305-_ _ _-1_ _
24,8 ±0,8
7,2
Ø29,8
ca. 80...240
see ordering code
M12x1
TM1-_ _ _ _-305-_ _ _-4_ _

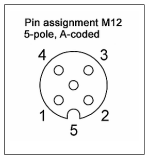
Technical Data

Type	**TM1-_ _ _ _-305-J_ _-_ _ _** **CAN SAE J1939**
Measured variables	Position, speed and temperature
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm
Measuring range speed	25 ... 1000 mm/s
Protocol	CAN SAE J1939
Programmable parameters	Offset position, averaging, baud rate, transmit mode, transmit cycle, source address
Node ID	128 ... 247 (dynamic address claiming)
Baud rate	250, 500 kBaud
Update rate (output)	1 kHz (internal measuring rate 0.5 kHz)
Resolution position	≤ 0.1 mm
Resolution speed	2 mm/s
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)
Tolerance of electr. zero point	±1 mm
Repeatability	≤ ±0.1 mm
Hysteresis	≤ ±0.1 mm
Temperature error	≤ ±15 ppm/K (min. 0.01 mm/K)
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub
Power drain w/o load	< 1.5 W
Overvoltage protection	40 VDC (6 s)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (all outputs vs. GND and supply voltage)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	w/o (internal load resistance 120 Ω on request)
Environmental Data	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67 (Connector system M12, fastened, when correctly fitted in cylinder: IP69)
Operating temperature	-40 ... +105°C, -40 ... +85°C (connector system M12)
Operating humidity	0 ... 95 % R.H. (no condensation)
Working pressure	≤ 350 bar
Pressure peaks	≤ 450 bar
Burst pressure	> 700 bar
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	391 years
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
EMC Compatibility	
ISO 10605 ESD (Handling/Component)	8 kV / 15 kV
ISO 11452-2 Radiated HF-fields	100 V/m
ISO 11452-4 BCI (Bulk current injection)	200 mA
CISPR 25 Radiated emission	Level 4
ISO 7637-2 Transient Emissions	Level 1/2
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b) Level 4
ISO 7637-3 Pulses on output lines	(3a, 3b) Fast Level 2
ISO 16750 Pulses on supply lines	Starting profile Level 4 @12 V / Level 3 @24 V, Load dump A +200 V
EN 13309 Construction machinery	
ISO 14982 Agricult./forestry machines	
Emission/Immunity	Exceeds E1 requirements
	The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.

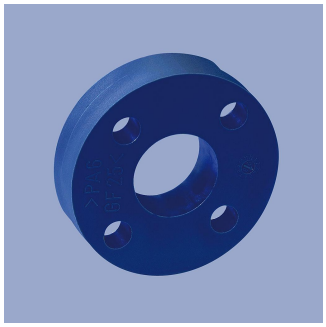
FS = Full scale: Signal span according to electrical measuring range

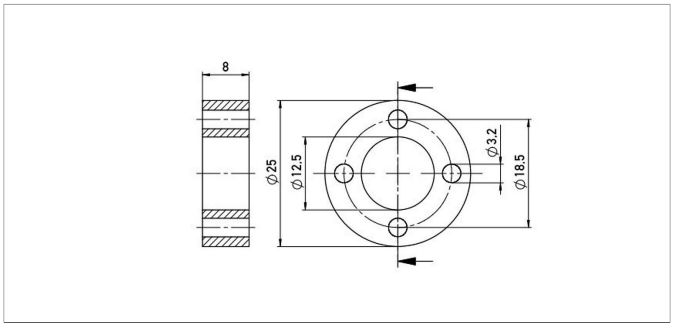
Connection Assignment

Signal	Connector code 106	Plug system code 4_ _
Supply voltage Ub	Pin 2	Pin 2
GND	Pin 3	Pin 3
CAN_H	Pin 4	Pin 4
CAN_L	Pin 5	Pin 5
Not assigned	Pin 1	Pin 1



Position Markers



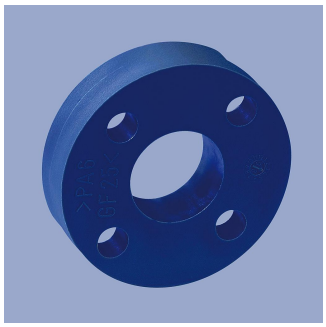


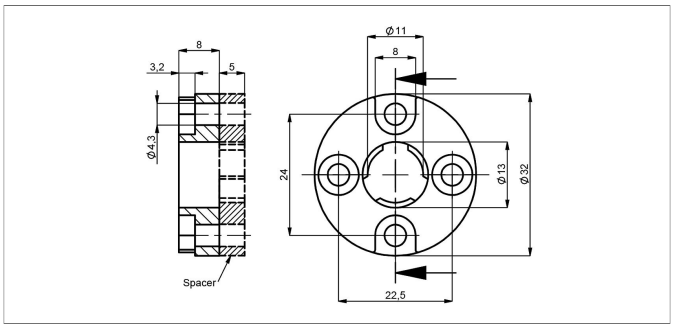
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





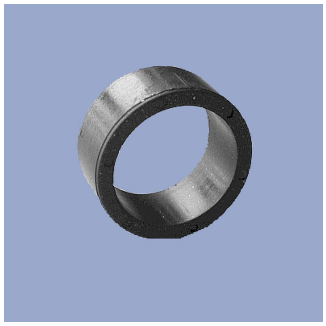
Z-TH1-P19

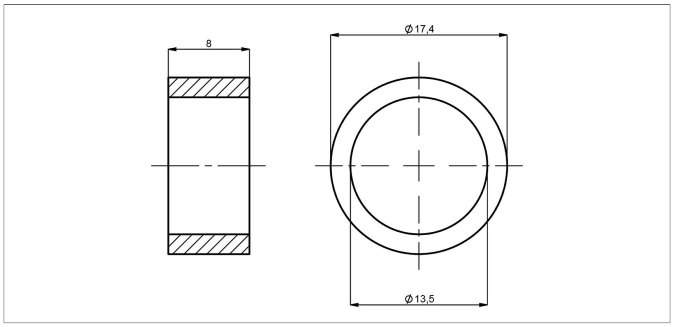
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



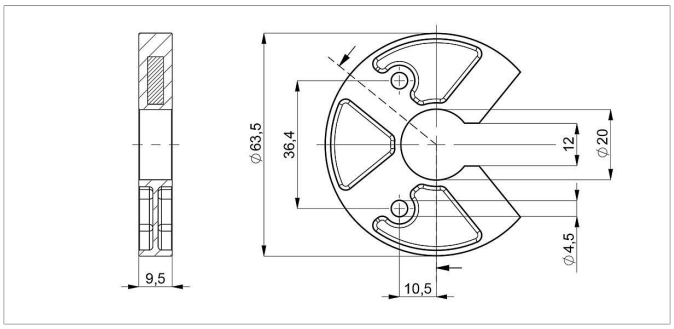


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

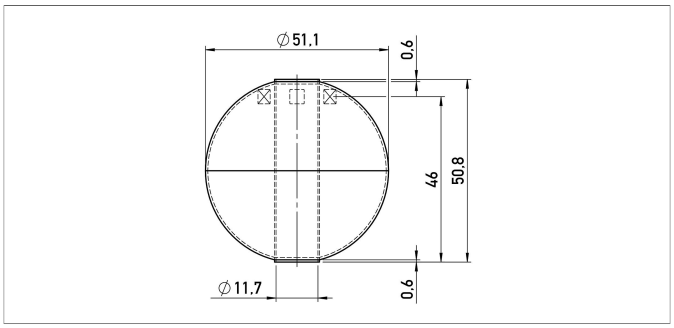
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

Position Markers

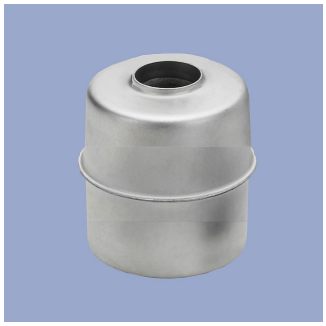


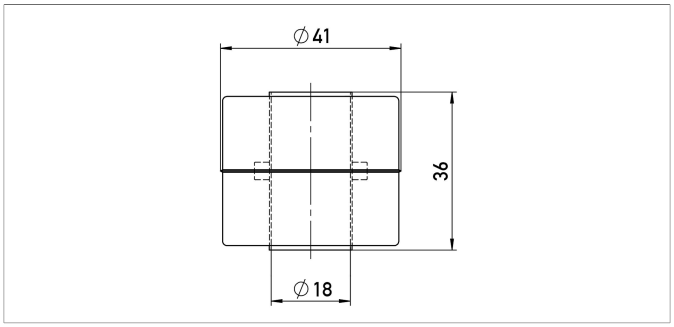
Z-TH1-P32

Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1



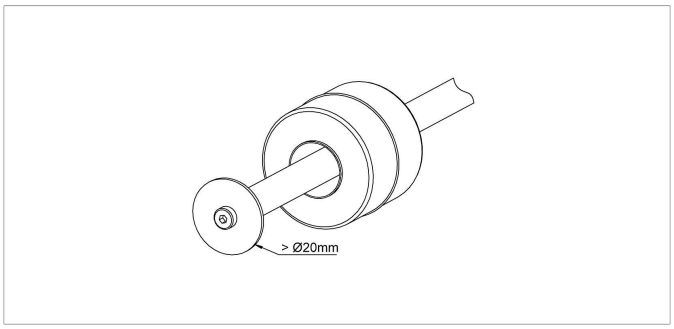


Z-TH1-P21

Cylinder floating position marker

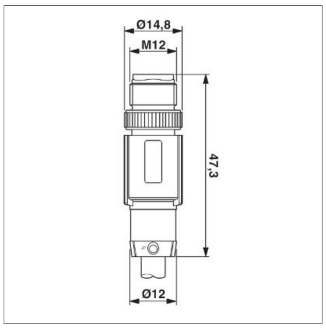
Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

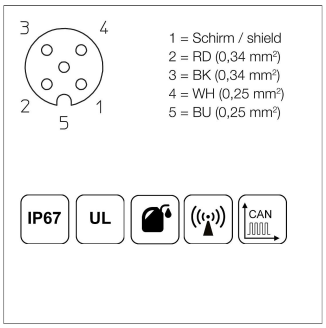
P/N	Pack. unit [pcs]
400056044	1



When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

Connector System M12

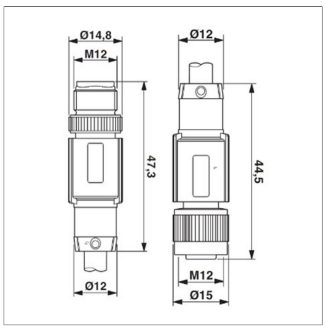


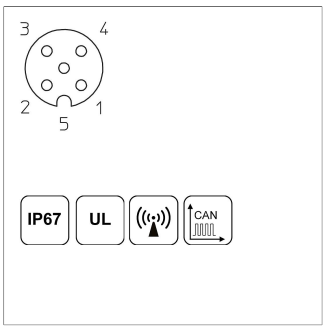


EEM-33-49/50/51
M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), open ended

Plug housing	TPU
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106368	EEM-33-49	2 m
400106371	EEM-33-50	5 m
400106372	EEM-33-51	10 m

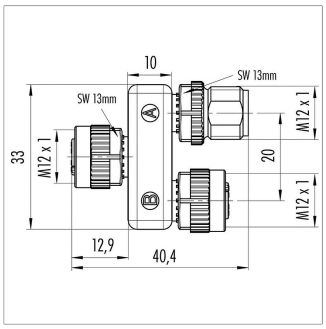


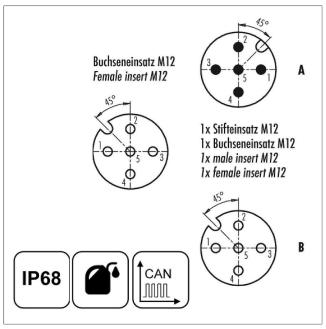


EEM-33-52
M12x1 Mating female/male connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), CAN-Bus

Plug housing	PUR
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (plug/socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106373	EEM-33-52	5 m

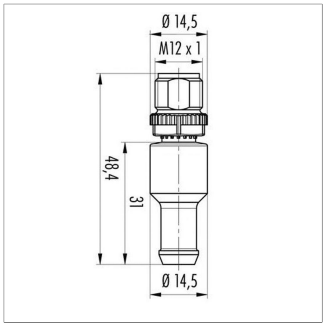


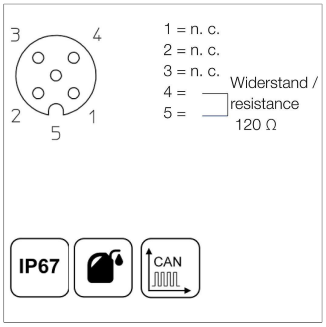


EEM-33-45
M12x1 splitter / T-connector, 5-pin, A-coded, IP68,1:1 connection, female - male - female, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056145	EEM-33-45





EEM-33-47
M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056147	EEM-33-47

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

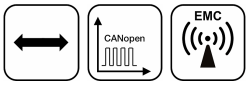
UL UL - approved

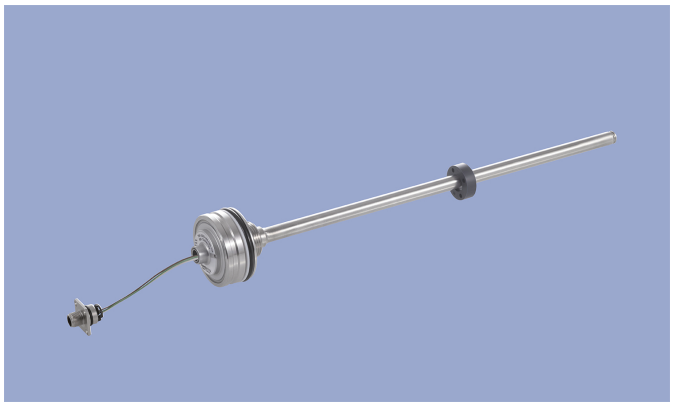
CAN CAN-Bus

novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Plug-in Flange
CANopen
Mobile Applications





Special Features
- For integration in pneumatic and hydraulic cylinders
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Ring-shaped position marker does not contact sensor
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in mobile applications with highest EMC requirements such as ISO pulses and high interferences to ISO 11452, exceeds E1 requirements
- Other configurations see separate data sheets

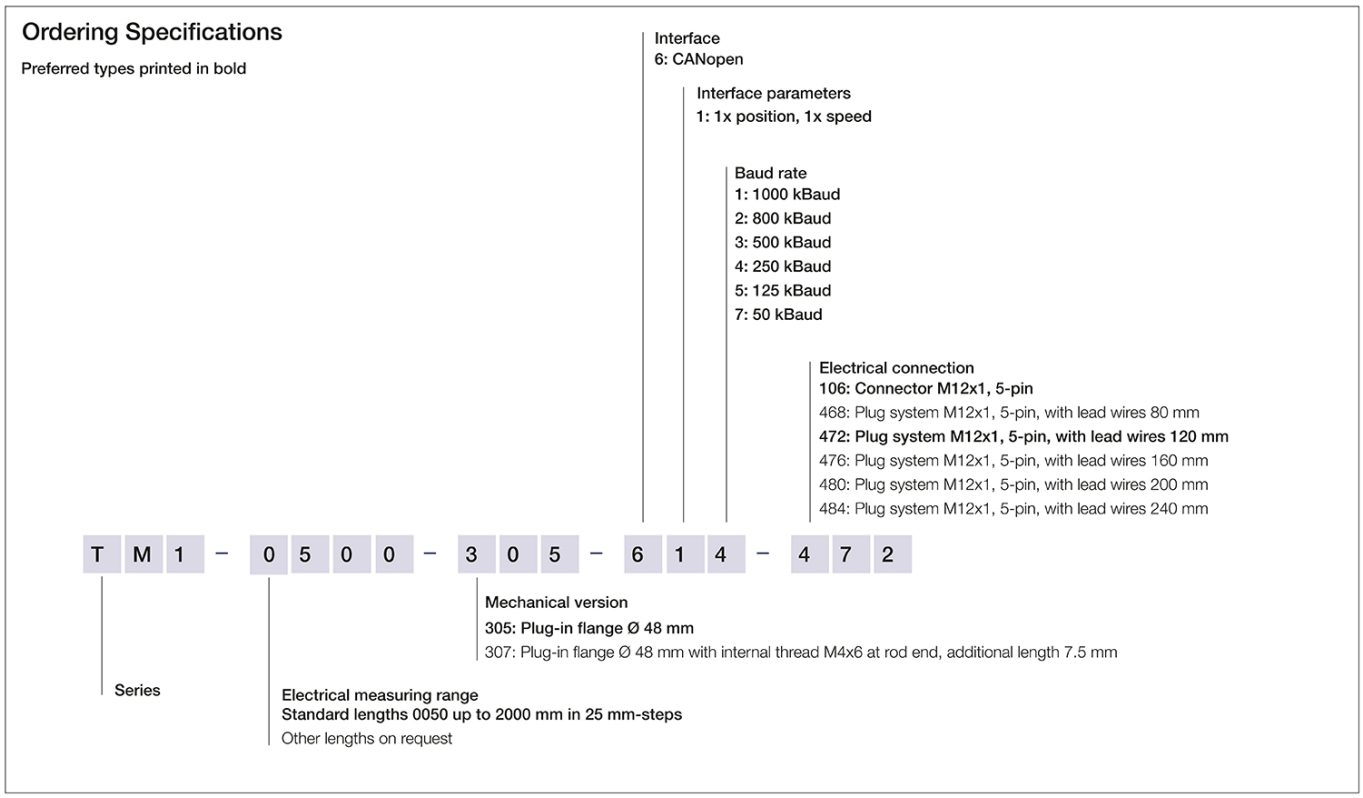
Applications
Hydraulic or pneumatic cylinders in
- Agricultural and forestry machinery
- Construction machines
- Vehicles with loading and unloading devices
- Vehicles with extension arms

The absolute position transducer can be used directly in-cylinder and thus enables a compact and cost-effective position measurement. The sensor consists of a stainless steel flange welded to a pressure tight rod and can therefore be used in harsh environments.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

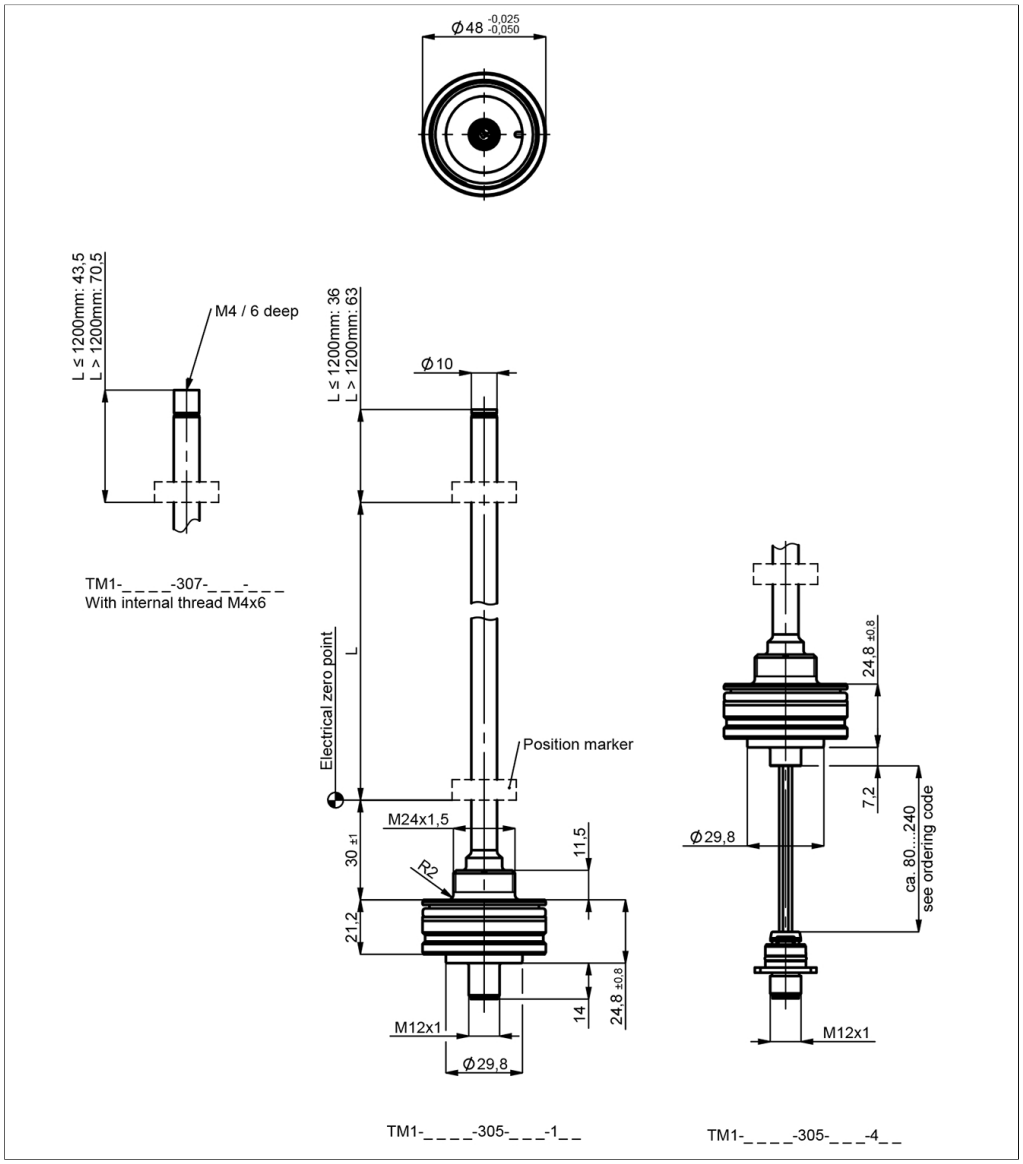
Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring FKM 80, Supporting ring: PTFE
Mounting	Plugged into cylinders, secured in position with set screw M5 ISO 4026
Electrical connection	Connector M12x1, A-coded / Connector system M12x1, A-coded with lead wires

Mechanical Data	
Dimensions	See dimension drawing

Ordering Specifications



Drawing


Ø48 -0,025 -0,050
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-307-_ _ _-_ _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
Electrical zero point
L
Position marker
M24x1,5
30 ±1
R2
11,5
21,2
14
24,8 ±0,8
M12x1
Ø29,8
TM1-_ _ _ _-305-_ _ _-1_ _
24,8 ±0,8
7,2
Ø29,8
ca. 80...240
see ordering code
M12x1
TM1-_ _ _ _-305-_ _ _-4_ _

Technical Data

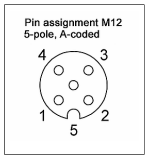
CANopen

Type	**TM1-_ _ _ _-305-6_ _-_ _ _**
	CANopen
Measured variables	Position, speed and temperature
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm
Measuring range speed	25 ... 1000 mm/s
Protocol	CANopen protocol to CiA DS-301 V4.2.0, Device profile DS-406 V3.2 Encoder Class C2, LSS services to CiA DS-305 V1.1.2
Programmable parameters	Position, speed, cams, working areas, temperature, node ID, baud rate
Node ID	1 ... 127 (default 127)
Baud rate	50 ... 1000 kBaud
Update rate (output)	1 kHz (internal measuring rate 0.5 kHz)
Resolution position	≤ 0.1 mm
Resolution speed	2 mm/s
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)
Tolerance of electr. zero point	±1 mm
Repeatability	≤ ±0.1 mm
Hysteresis	≤ ±0.1 mm
Temperature error	≤ ±15 ppm/K (min. 0.01 mm/K)
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub
Power drain w/o load	< 1.5 W
Overvoltage protection	40 VDC (6 s)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (all outputs vs. GND and supply voltage)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	w/o (internal load resistance 120 Ω on request)
Environmental Data	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67 (Connector system M12, fastened, when correctly fitted in cylinder: IP69)
Operating temperature	-40 ... +105°C, -40 ... +85°C (connector system M12)
Operating humidity	0 ... 95 % R.H. (no condensation)
Working pressure	≤ 350 bar
Pressure peaks	≤ 450 bar
Burst pressure	> 700 bar
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	391 years
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
EMC Compatibility	
ISO 10605 ESD (Handling/Component)	8 kV / 15 kV
ISO 11452-2 Radiated HF-fields	100 V/m
ISO 11452-4 BCI (Bulk current injection)	200 mA
CISPR 25 Radiated emission	Level 4
ISO 7637-2 Transient Emissions	Level 1/2
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b) Level 4
ISO 7637-3 Pulses on output lines	(3a, 3b) Fast Level 2
ISO 16750 Pulses on supply lines	Starting profile Level 4 @12 V / Level 3 @24 V, Load dump A +200 V
EN 13309 Construction machinery	
ISO 14982 Agricult./forestry machines	
Emission/Immunity	Exceeds E1 requirements
	The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.

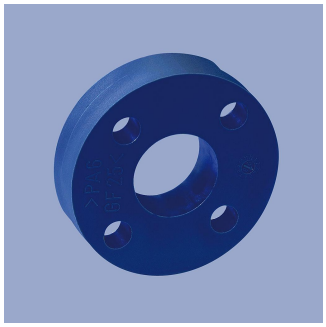
FS = Full scale: Signal span according to electrical measuring range

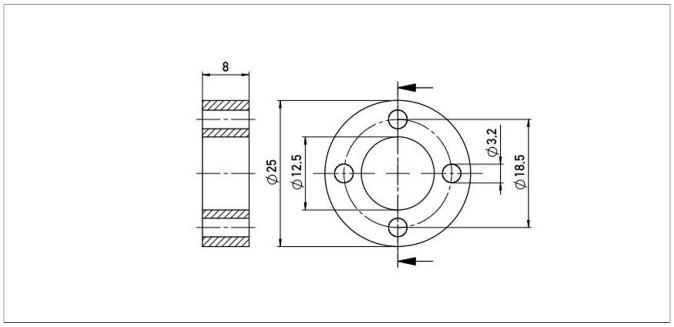
Connection Assignment

Signal	Connector code 106	Plug system code 4_ _
Supply voltage Ub	Pin 2	Pin 2
GND	Pin 3	Pin 3
CAN_H	Pin 4	Pin 4
CAN_L	Pin 5	Pin 5
Not assigned	Pin 1	Pin 1



Position Markers



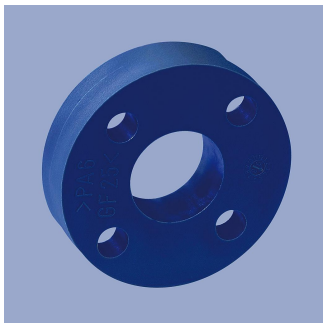


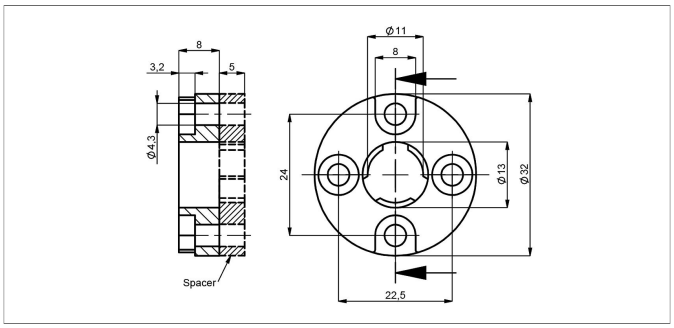
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





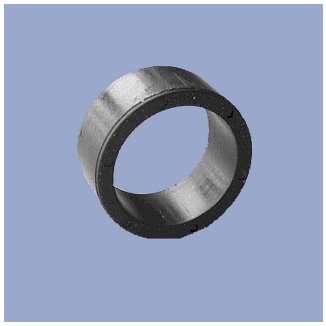
Z-TH1-P19

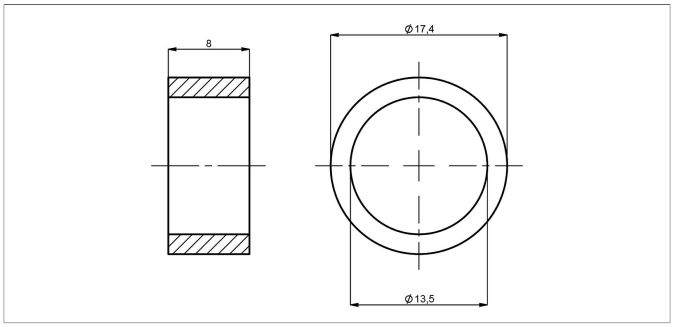
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



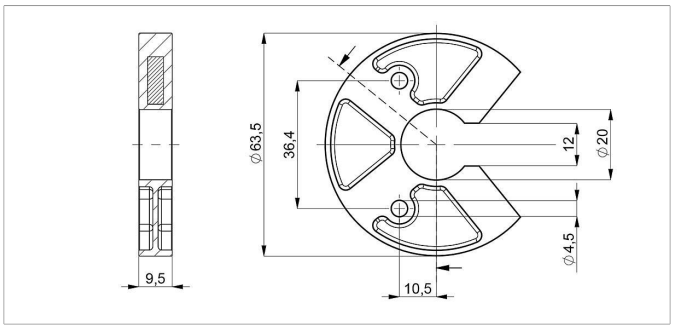


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

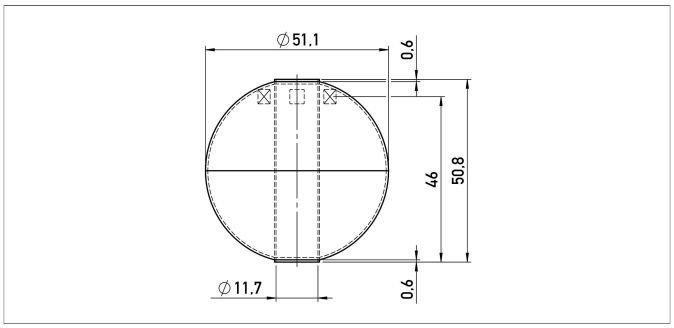
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

Position Markers

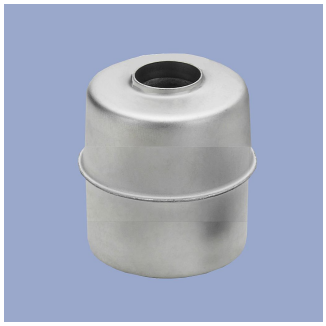


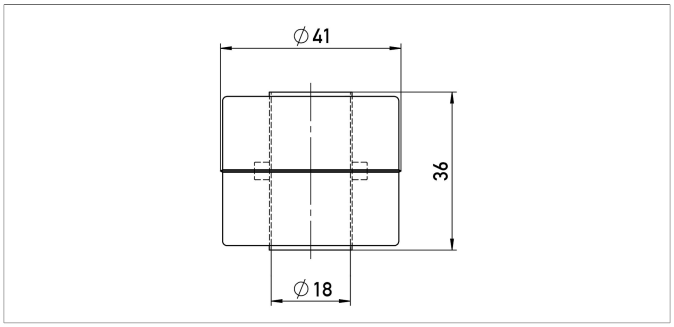
Z-TH1-P32

Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1



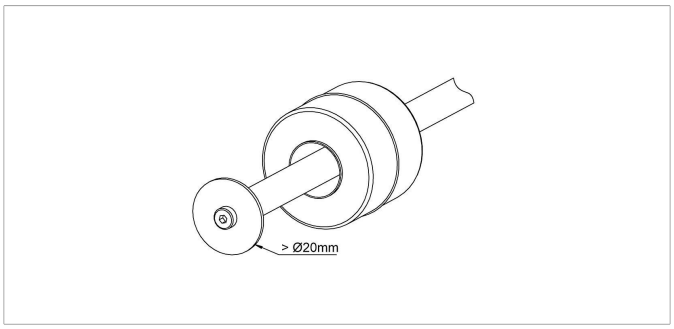


Z-TH1-P21

Cylinder floating position marker

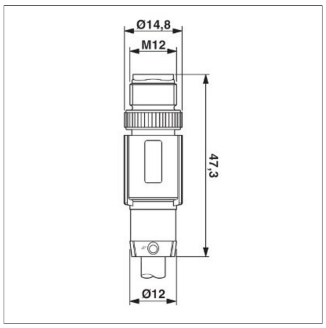
Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

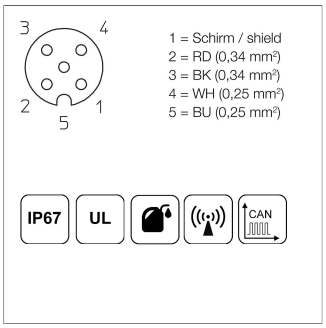
P/N	Pack. unit [pcs]
400056044	1



When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

Connector System M12

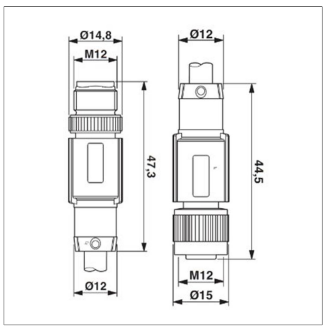


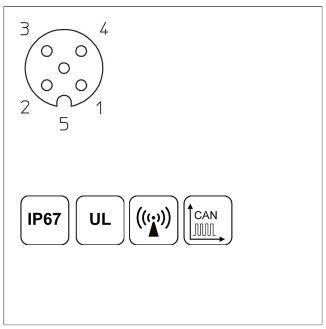


EEM-33-49/50/51
M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), open ended

Plug housing	TPU
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106368	EEM-33-49	2 m
400106371	EEM-33-50	5 m
400106372	EEM-33-51	10 m

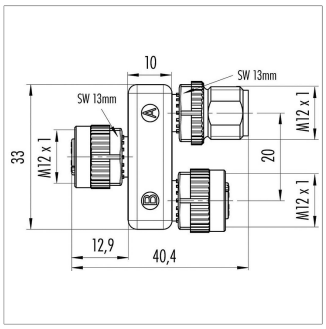


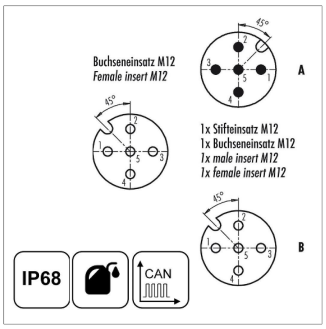


EEM-33-52
M12x1 Mating female/male connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), CAN-Bus

Plug housing	PUR
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (plug/socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106373	EEM-33-52	5 m

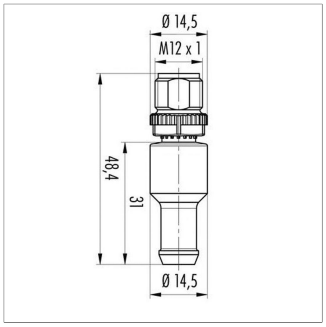


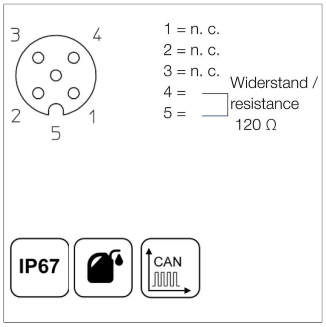


EEM-33-45
M12x1 splitter / T-connector, 5-pin, A-coded, IP68,1:1 connection, female - male - female, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056145	EEM-33-45





EEM-33-47
M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056147	EEM-33-47

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

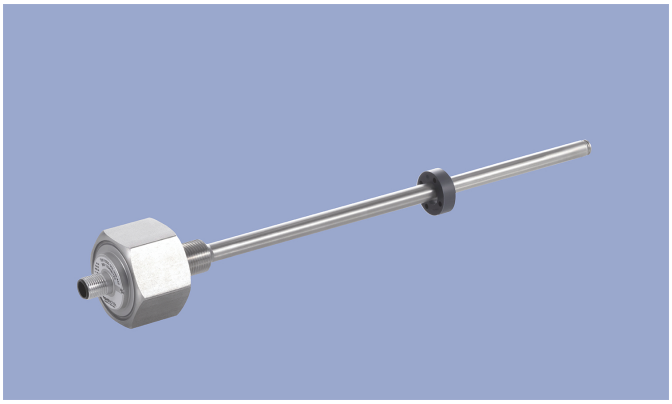
UL UL - approved

CAN CAN-Bus

novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Screw flange
CAN SAE J1939
Industrial



Special Features
- Compact design for tight spaces
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Non-contacting position detection with ring-shaped position marker
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in industrial applications
- Other configurations see separate data sheets

Applications
- Manufacturing Engineering
- Level measurement
- Actuators

The absolute linear transducer TM1 enables a compact and cost-effective position measurement. It consists of a stainless steel flange welded to a pressure-resistant rod and can therefore be used under harsh environmental conditions.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

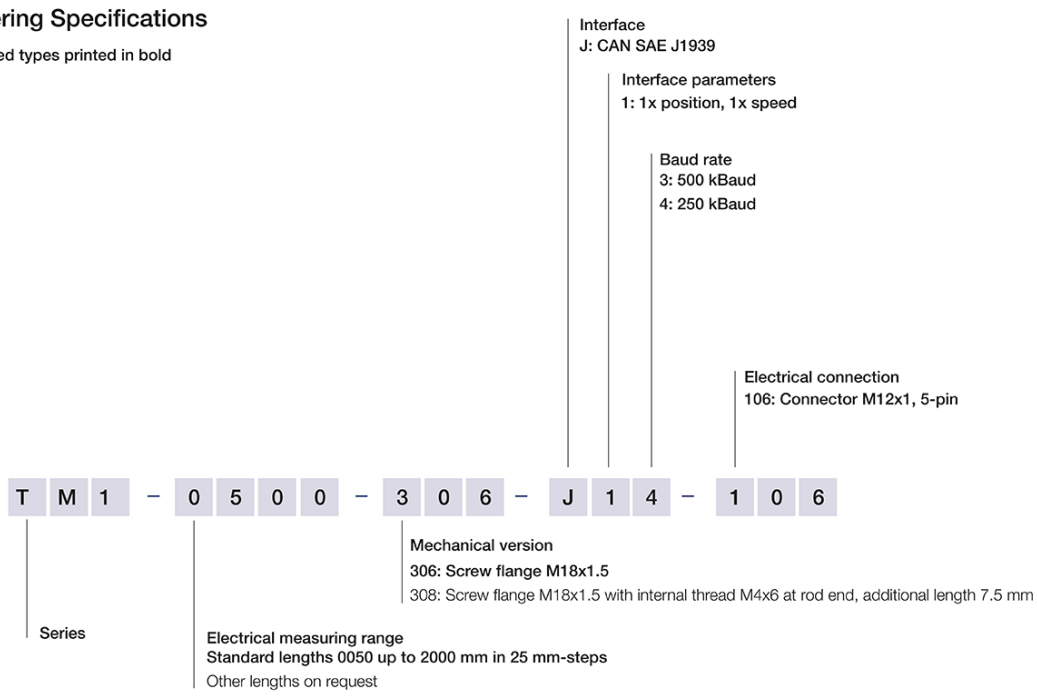
Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring NBR 90 SH A
Mounting	Screwed via thread M18x1.5
Electrical connection	Connector M12x1, A-coded

Mechanical Data	
Dimensions	See dimension drawing

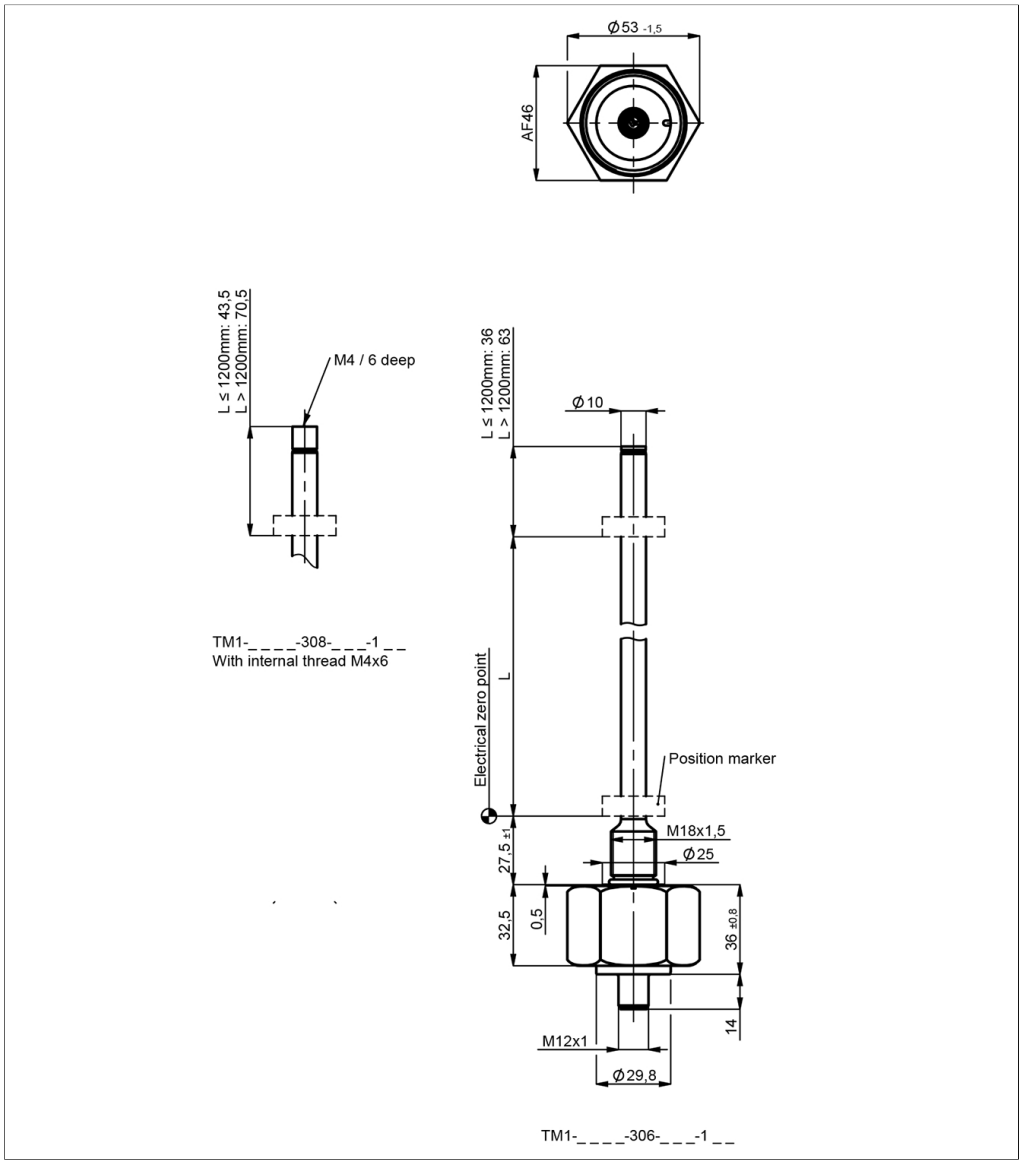
Ordering Specifications

Ordering Specifications

Preferred types printed in bold



Drawing


Ø53 -1,5
AF46
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-308-_ _ _-1 _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
L
Electrical zero point
Position marker
M18x1,5
Ø25
27,5 ±1
32,5
0,5
36 ±0,8
14
M12x1
Ø29,8
TM1-_ _ _ _-306-_ _ _-1 _ _

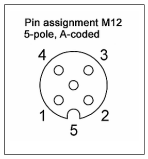
Technical Data

Type	**TM1-_ _ _ _-306-J_ _-106** **CAN SAE J1939**
Measured variables	Position, speed and temperature
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm
Measuring range speed	25 ... 1000 mm/s
Protocol	CAN SAE J1939
Programmable parameters	Offset position, averaging, baud rate, transmit mode, transmit cycle, source address
Node ID	128 ... 247 (dynamic address claiming)
Baud rate	250, 500 kBaud
Update rate (output)	1 kHz (internal measuring rate 0.5 kHz)
Resolution	≤ 0.1 mm
Resolution speed	2 mm/s
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)
Tolerance of electr. zero point	±1 mm
Repeatability	≤ ±0.1 mm
Hysteresis	≤ ±0.1 mm
Temperature error	≤ ±15 ppm/K (min. 0.01 mm/K)
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub
Power drain w/o load	< 1.5 W
Overvoltage protection	40 VDC (6 s)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (all outputs vs. GND and supply voltage)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	w/o (internal load resistance 120 Ω on request)
Environmental Data	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67
Operating temperature	-40 ... +105°C
Operating humidity	0 ... 95 % R.H. (no condensation)
Working pressure	≤ 350 bar
Pressure peaks	≤ 450 bar
Burst pressure	> 700 bar
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	391 years
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
EMC Compatibility	
EN 61000-4-2 ESD (contact/air discharge)	4 kV, 8 kV
EN 61000-4-3 Electromagnetic fields (RFI)	10 V/m
EN 61000-4-4 Fast transients (burst)	1 kV
EN 61000-4-6 Cond. disturbances (HF fields)	10 V eff.
EN 55016-2-3 Radiated disturbances	Industrial and residential area

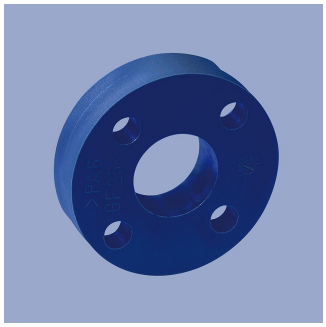
FS = Full scale: Signal span according to electrical measuring range

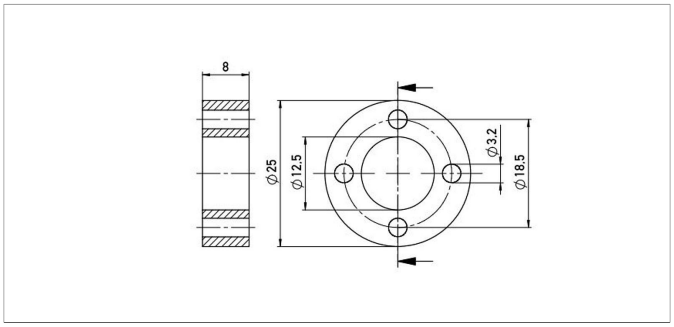
Connection Assignment

Signal	Connector code 106
Supply voltage Ub	Pin 2
GND	Pin 3
CAN_H	Pin 4
CAN_L	Pin 5
CAN_SHLD	Pin 1
	Connect cable shielding to protection earth



Position Markers



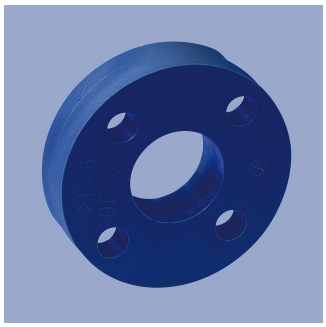


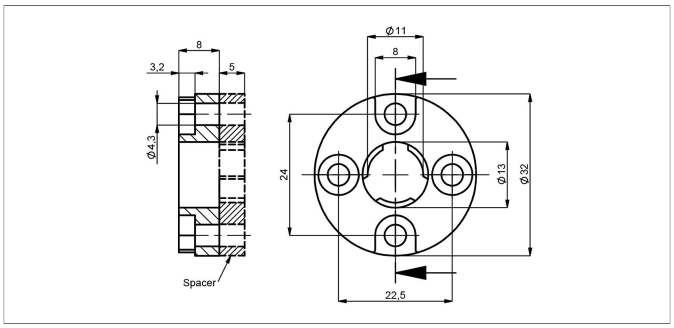
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





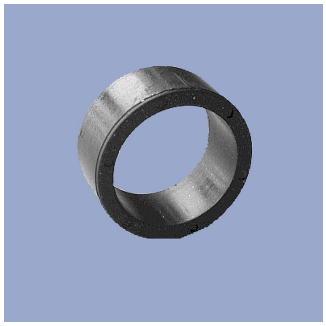
Z-TH1-P19

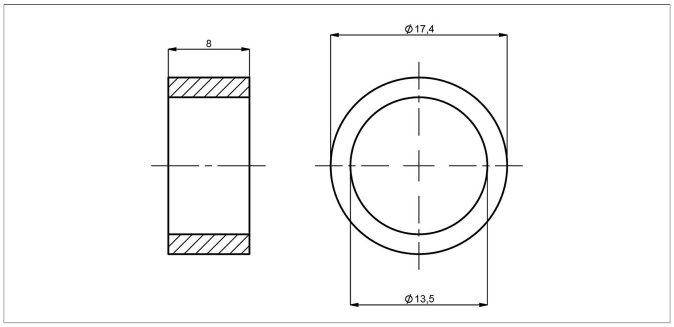
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



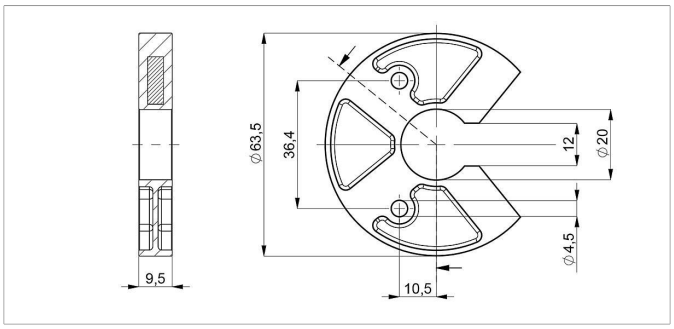


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

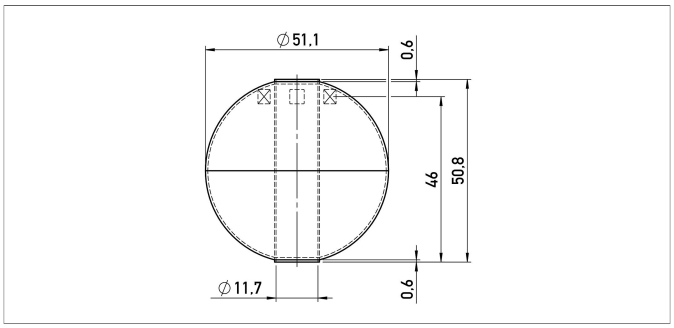
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

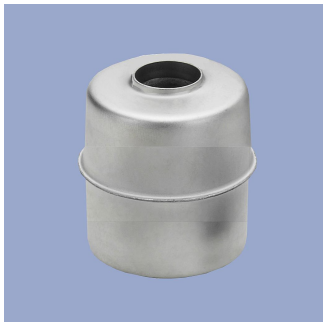
Position Markers

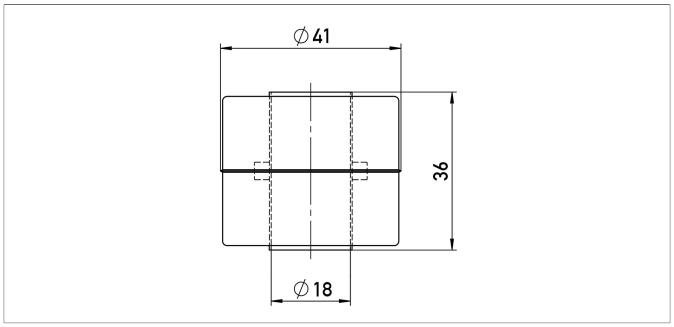


Z-TH1-P32
Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1

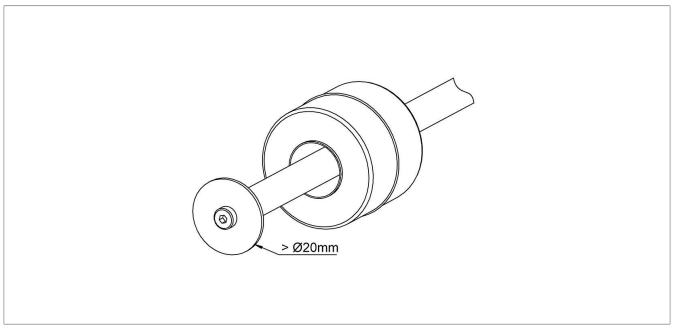




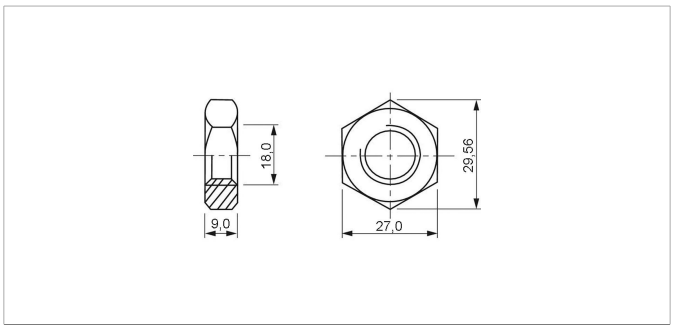
Z-TH1-P21
Cylinder floating position marker

Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

P/N	Pack. unit [pcs]
400056044	1



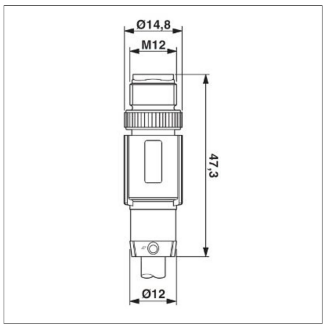
When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

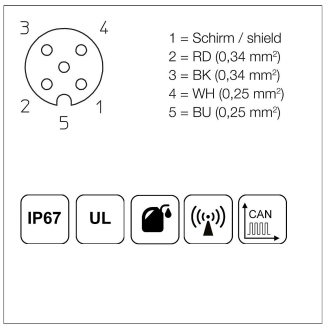


Z-TH1-M01
Lock nut ISO 8675, M18x1.5-A2

P/N	Pack. unit [pcs]
400056090	1

Connector System M12

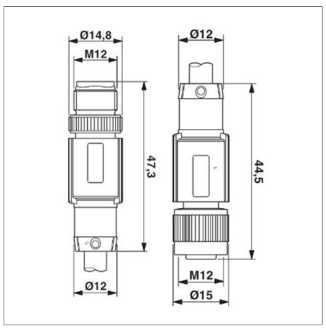


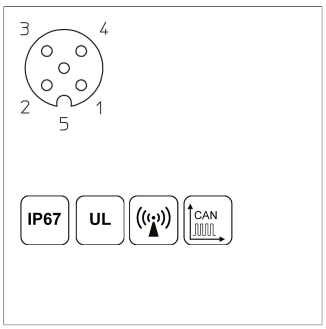


EEM-33-49/50/51
M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), open ended

Plug housing	TPU
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106368	EEM-33-49	2 m
400106371	EEM-33-50	5 m
400106372	EEM-33-51	10 m

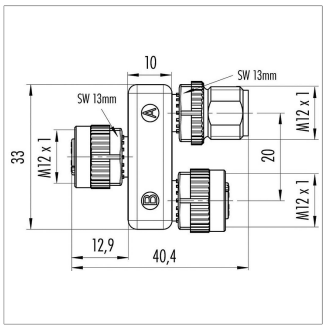


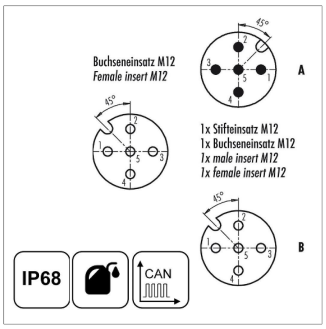


EEM-33-52
M12x1 Mating female/male connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), CAN-Bus

Plug housing	PUR
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (plug/socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106373	EEM-33-52	5 m

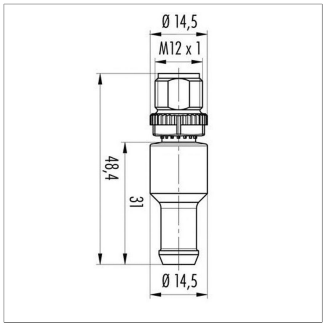


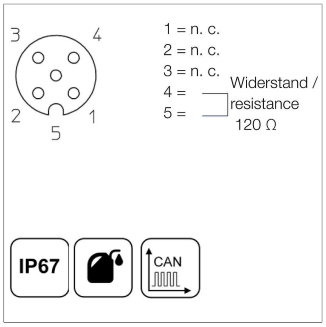


EEM-33-45
M12x1 splitter / T-connector, 5-pin, A-coded, IP68,1:1 connection, female - male - female, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056145	EEM-33-45





EEM-33-47
M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056147	EEM-33-47

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

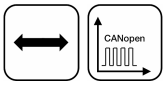
UL UL - approved

CAN CAN-Bus

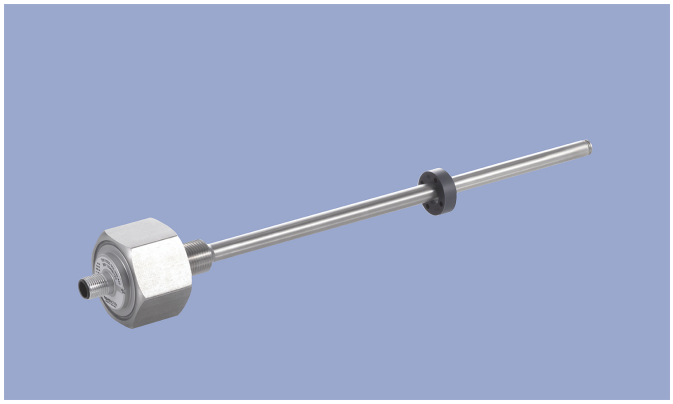
novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Screw flange
CANopen
Industrial



CE



Special Features
- Compact design for tight spaces
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- Operating pressure up to 350 bar, peaks up to 450 bar
- Non-contacting position detection with ring-shaped position marker
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in industrial applications
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- Actuators

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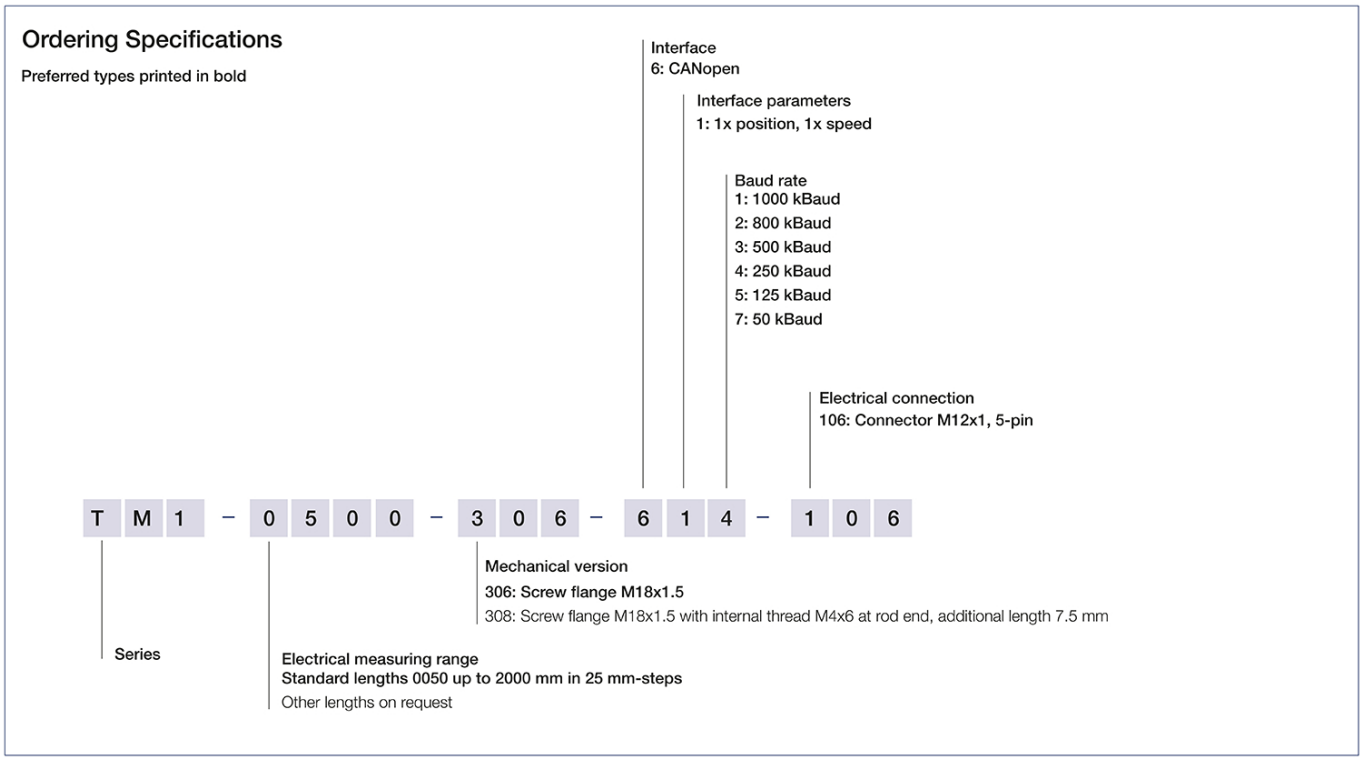
The passive ring-shaped position marker allows a mechanically decoupled measurement.

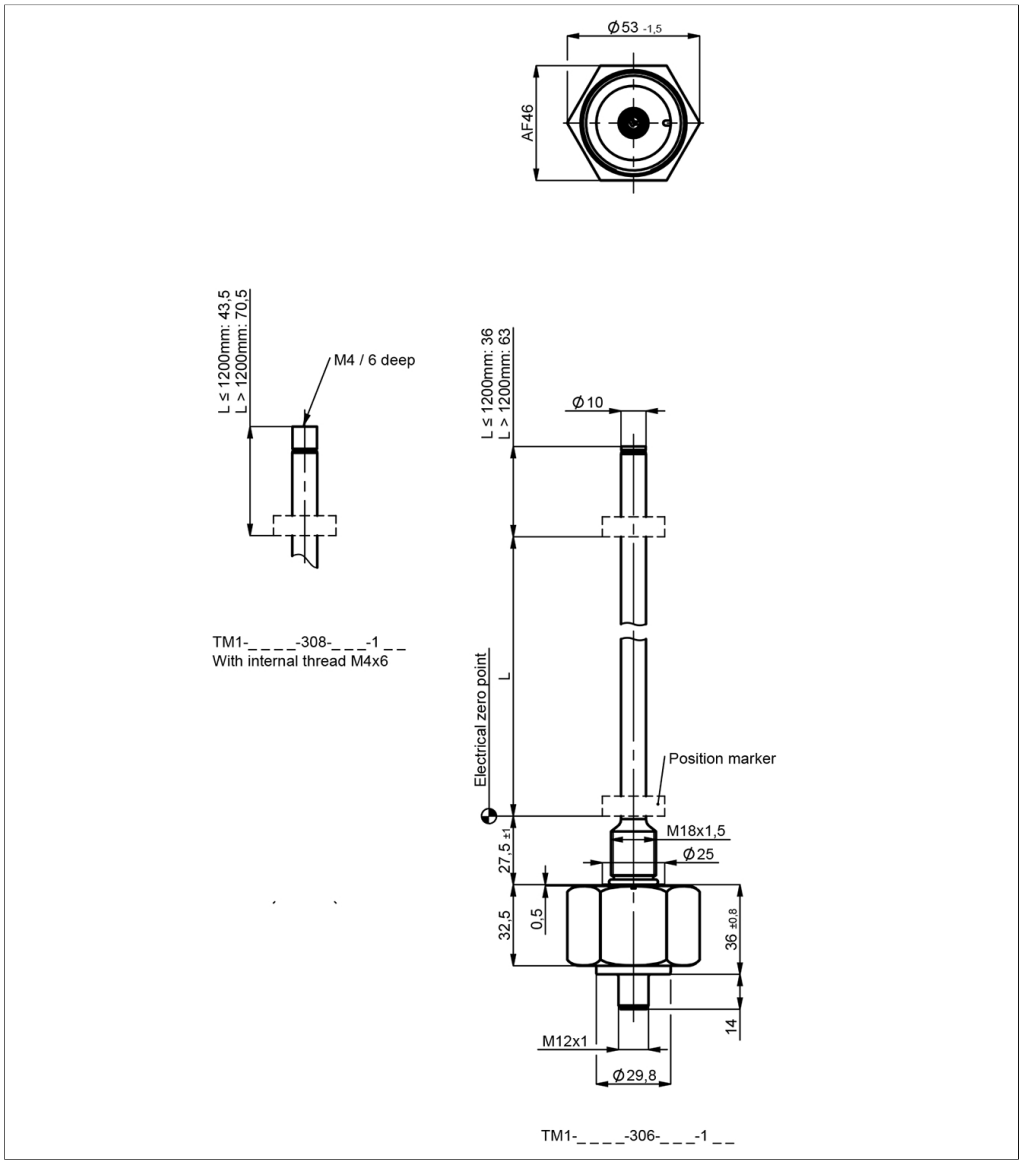
Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring NBR 90 SH A
Mounting	Screwed via thread M18x1.5
Electrical connection	Connector M12x1, A-coded

Mechanical Data	
Dimensions	See dimension drawing

Ordering Specifications



Drawing


Ø53 -1,5
AF46
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-308-_ _ _-1 _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
L
Electrical zero point
Position marker
M18x1,5
Ø25
27,5 ±1
32,5
0,5
36 ±0,8
14
M12x1
Ø29,8
TM1-_ _ _ _-306-_ _ _-1 _ _

Technical Data

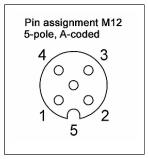
CANopen

Type	**TM1-_ _ _ _-306-6_ _-106**
	CANopen
Measured variables	Position, speed and temperature
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm
Measuring range speed	25 ... 1000 mm/s
Protocol	CANopen protocol to CiA DS-301 V4.2.0, Device profile DS-406 V3.2 Encoder Class C2, LSS services to CiA DS-305 V1.1.2
Programmable parameters	Position, speed, cams, working areas, temperature, node ID, baud rate
Node ID	1 ... 127 (default 127)
Baud rate	50 ... 1000 kBaud
Update rate (output)	1 kHz (internal measuring rate 0.5 kHz)
Resolution	≤ 0.1 mm
Resolution speed	2 mm/s
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)
Tolerance of electr. zero point	±1 mm
Repeatability	≤ ±0.1 mm
Hysteresis	≤ ±0.1 mm
Temperature error	≤ ±15 ppm/K (min. 0.01 mm/K)
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub
Power drain w/o load	< 1.5 W
Overvoltage protection	40 VDC (6 s)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (all outputs vs. GND and supply voltage)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	w/o (internal load resistance 120 Ω on request)
Environmental Data	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67
Operating temperature	-40 ... +105°C
Operating humidity	0 ... 95 % R.H. (no condensation)
Working pressure	≤ 350 bar
Pressure peaks	≤ 450 bar
Burst pressure	> 700 bar
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	391 years
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
EMC Compatibility	
EN 61000-4-2 ESD (contact/air discharge)	4 kV, 8 kV
EN 61000-4-3 Electromagnetic fields (RFI)	10 V/m
EN 61000-4-4 Fast transients (burst)	1 kV
EN 61000-4-6 Cond. disturbances (HF fields)	10 V eff.
EN 55016-2-3 Radiated disturbances	Industrial and residential area

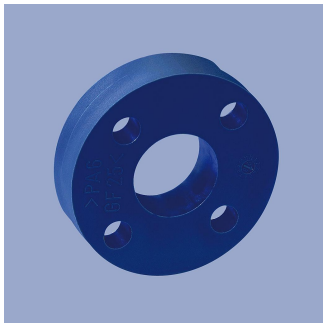
FS = Full scale: Signal span according to electrical measuring range

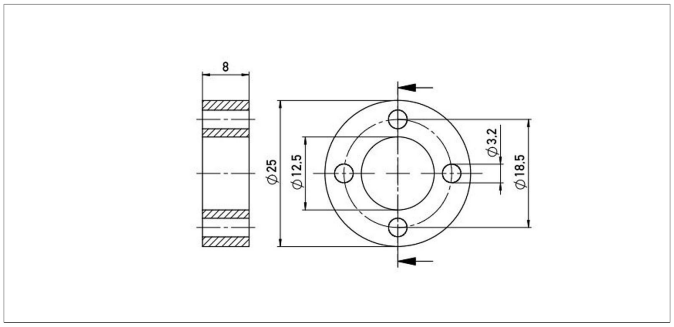
Connection Assignment

Signal	Connector code 106
Supply voltage Ub	Pin 2
GND	Pin 3
CAN_H	Pin 4
CAN_L	Pin 5
Do not connect	Pin 1
	Connect cable shielding to protection earth



Position Markers



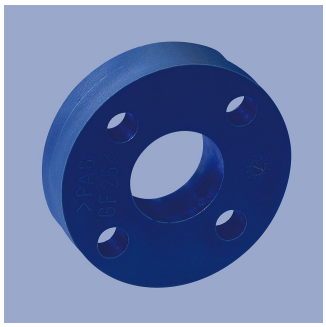


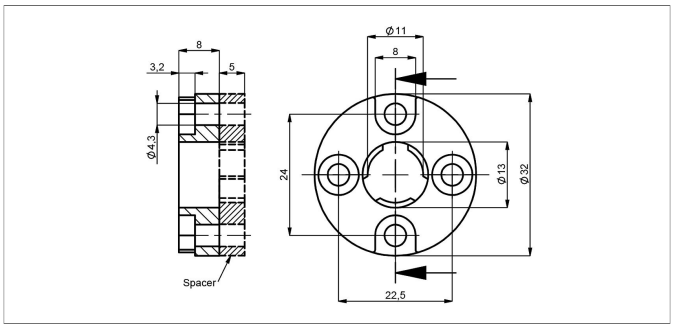
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





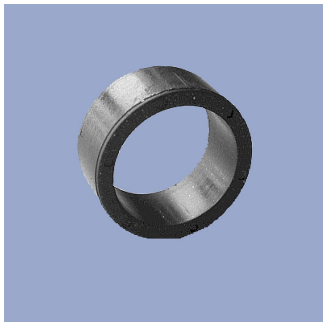
Z-TH1-P19

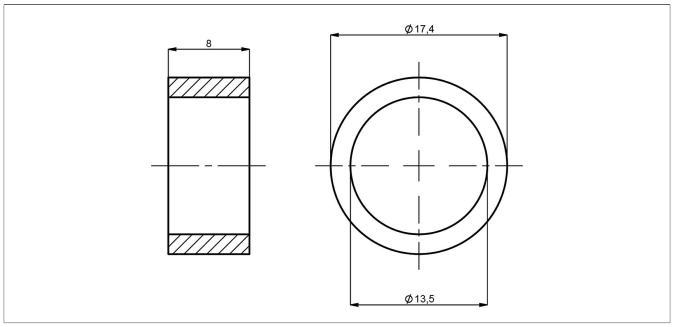
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



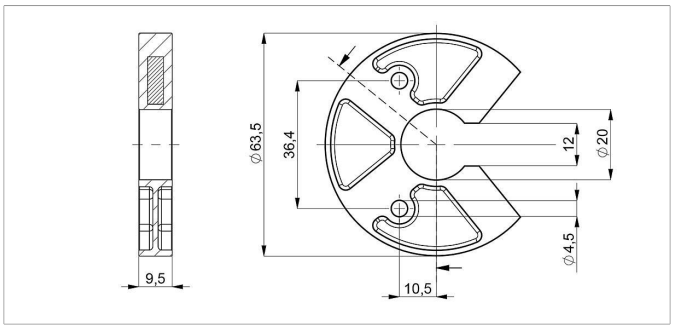


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

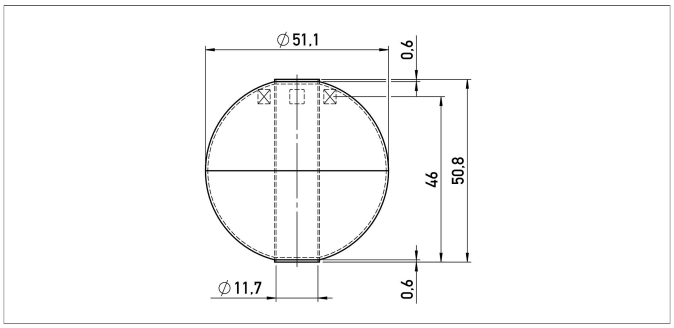
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

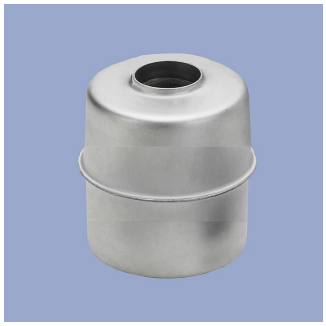
Position Markers

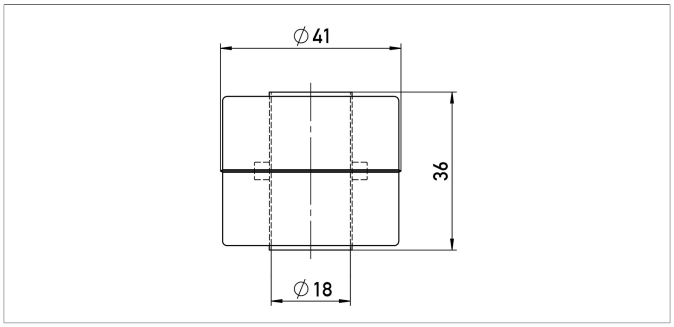


Z-TH1-P32
Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1

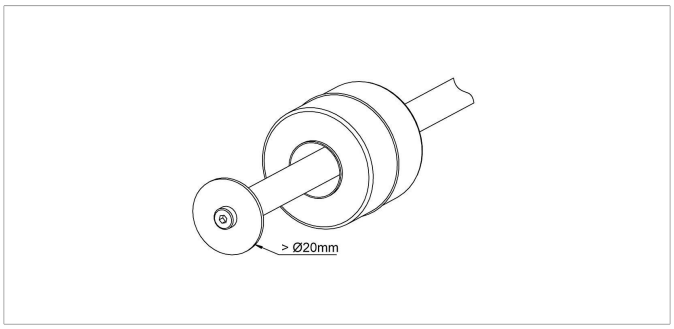




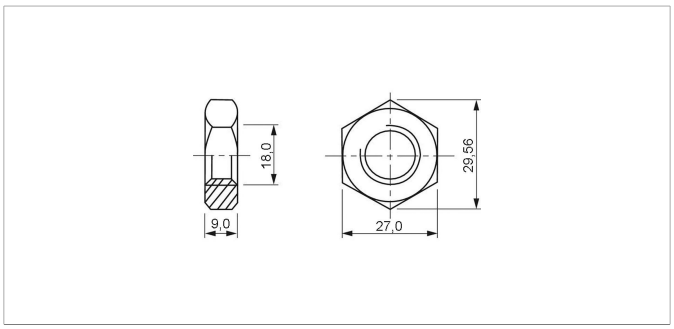
Z-TH1-P21
Cylinder floating position marker

Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

P/N	Pack. unit [pcs]
400056044	1



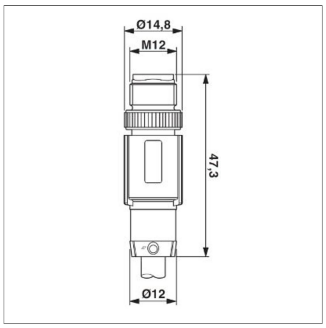
When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

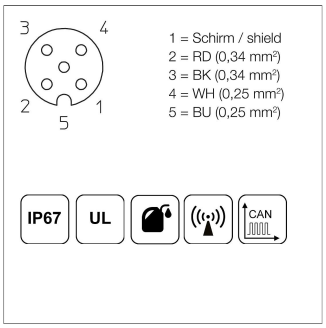


Z-TH1-M01
Lock nut ISO 8675, M18x1.5-A2

P/N	Pack. unit [pcs]
400056090	1

Connector System M12

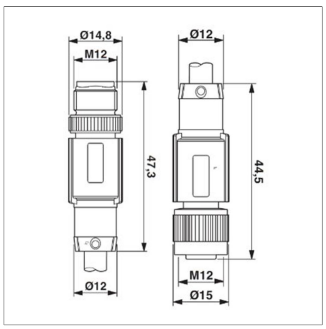


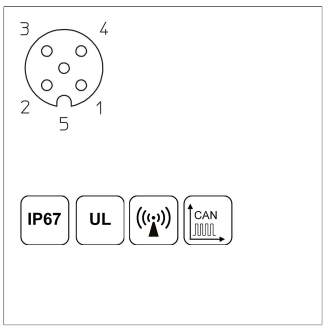


EEM-33-49/50/51
M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), open ended

Plug housing	TPU
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106368	EEM-33-49	2 m
400106371	EEM-33-50	5 m
400106372	EEM-33-51	10 m

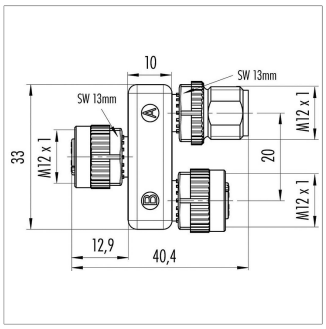


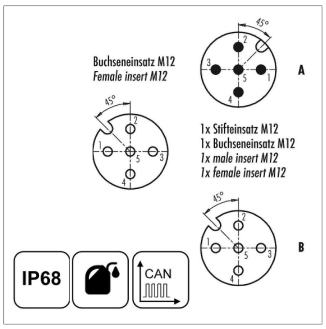


EEM-33-52
M12x1 Mating female/male connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), CAN-Bus

Plug housing	PUR
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (plug/socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106373	EEM-33-52	5 m

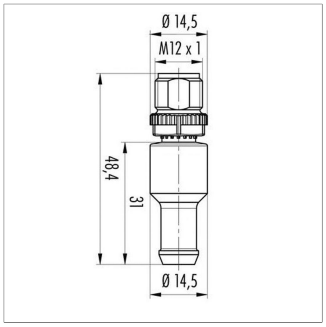


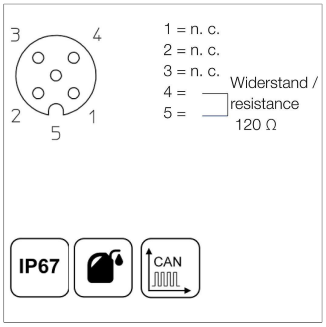


EEM-33-45
M12x1 splitter / T-connector, 5-pin, A-coded, IP68,1:1 connection, female - male - female, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056145	EEM-33-45





EEM-33-47
M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056147	EEM-33-47

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

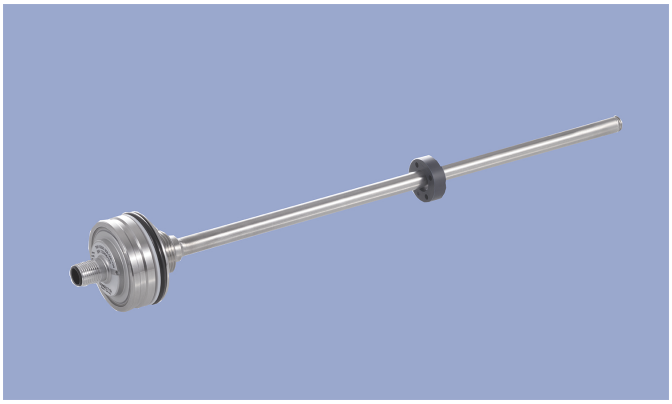
UL UL - approved

CAN CAN-Bus

novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Plug-in Flange
CAN SAE J1939
Industrial



Special Features
- Compact design for tight spaces
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Non-contacting position detection with ring-shaped position marker
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in industrial applications
- Other configurations see separate data sheets

Applications
- Manufacturing Engineering
- Level measurement
- Actuators

The absolute linear transducer TM1 enables a compact and cost-effective position measurement. It consists of a stainless steel flange welded to a pressure-resistant rod and can therefore be used under harsh environmental conditions.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring FKM 80, Supporting ring: PTFE
Mounting	Plugged and secured in position with set screw M5 ISO 4026
Electrical connection	Connector M12x1, A-coded / Connector system M12x1, A-coded with lead wires

Mechanical Data	
Dimensions	See dimension drawing

Ordering Specifications

Ordering Specifications

Preferred types printed in bold

Interface
J: CAN SAE J1939

Interface parameters
1: 1x position, 1x speed

Baud rate
3: 500 kBaud
4: 250 kBaud

Electrical connection
106: Connector M12x1, 5-pin
468: Plug system M12x1, 5-pin, with lead wires 80 mm*
472: Plug system M12x1, 5-pin, with lead wires 120 mm*
476: Plug system M12x1, 5-pin, with lead wires 160 mm*
480: Plug system M12x1, 5-pin, with lead wires 200 mm*
484: Plug system M12x1, 5-pin, with lead wires 240 mm*
* Only for installation in a cylinder

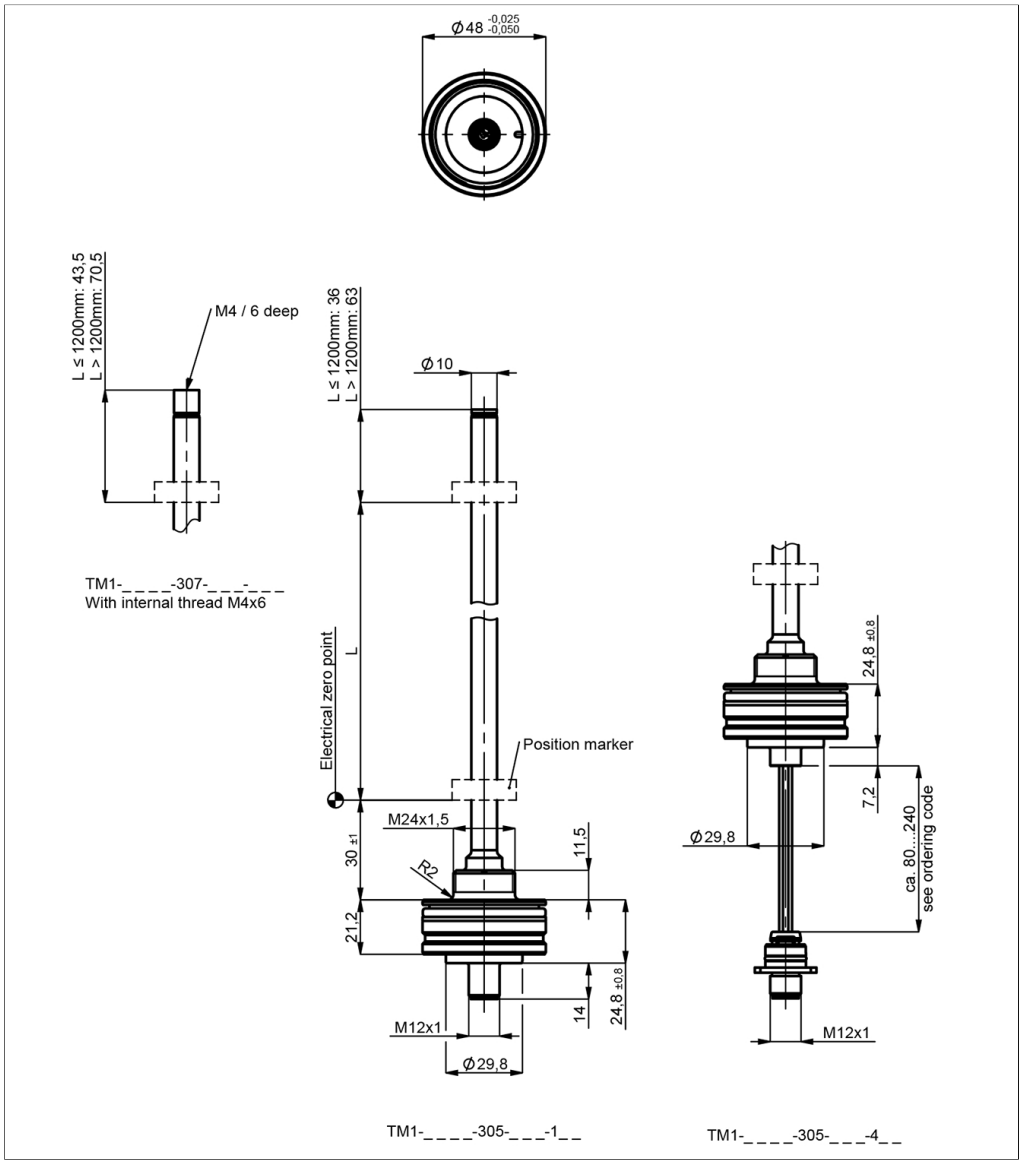
T	M	1	–	0	5	0	0	–	3	0	5	–	J	1	4	–	1	0	6

Mechanical version
305: Plug-in flange Ø 48 mm
307: Plug-in flange Ø 48 mm with internal thread M4x6 at rod end, additional length 7.5 mm

Series

Electrical measuring range
Standard lengths 0050 up to 2000 mm in 25 mm-steps
Other lengths on request

Drawing


Ø48 -0,025 -0,050
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-307-_ _ _-_ _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
Electrical zero point
L
Position marker
M24x1,5
30 ±1
R2
11,5
21,2
14
24,8 ±0,8
M12x1
Ø29,8
TM1-_ _ _ _-305-_ _ _-1_ _
24,8 ±0,8
7,2
Ø29,8
ca. 80...240
see ordering code
M12x1
TM1-_ _ _ _-305-_ _ _-4_ _

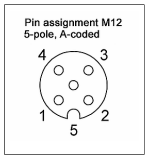
Technical Data

Type	**TM1-_ _ _ _-305-J_ _-106** **CAN SAE J1939**
Measured variables	Position, speed and temperature
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm
Measuring range speed	25 ... 1000 mm/s
Protocol	CAN SAE J1939
Programmable parameters	Offset position, averaging, baud rate, transmit mode, transmit cycle, source address
Node ID	128 ... 247 (dynamic address claiming)
Baud rate	250, 500 kBaud
Update rate (output)	1 kHz (internal measuring rate 0.5 kHz)
Resolution	≤ 0.1 mm
Resolution speed	2 mm/s
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)
Tolerance of electr. zero point	±1 mm
Repeatability	≤ ±0.1 mm
Hysteresis	≤ ±0.1 mm
Temperature error	≤ ±15 ppm/K (min. 0.01 mm/K)
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub
Power drain w/o load	< 1.5 W
Overvoltage protection	40 VDC (6 s)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (all outputs vs. GND and supply voltage)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	w/o (internal load resistance 120 Ω on request)
Environmental Data	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67 (Connector system M12, fastened, when correctly fitted in cylinder: IP69)
Operating temperature	-40 ... +105°C, -40 ... +85°C (connector system M12)
Operating humidity	0 ... 95 % R.H. (no condensation)
Working pressure	≤ 350 bar
Pressure peaks	≤ 450 bar
Burst pressure	> 700 bar
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	391 years
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
EMC Compatibility	
EN 61000-4-2 ESD (contact/air discharge)	4 kV, 8 kV
EN 61000-4-3 Electromagnetic fields (RFI)	10 V/m
EN 61000-4-4 Fast transients (burst)	1 kV
EN 61000-4-6 Cond. disturbances (HF fields)	10 V eff.
EN 55016-2-3 Radiated disturbances	Industrial and residential area
	Only for connector system M12: Data applies only inside a cylinder.
	The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.

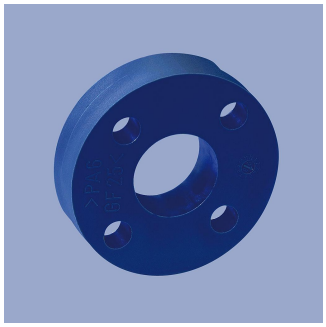
FS = Full scale: Signal span according to electrical measuring range

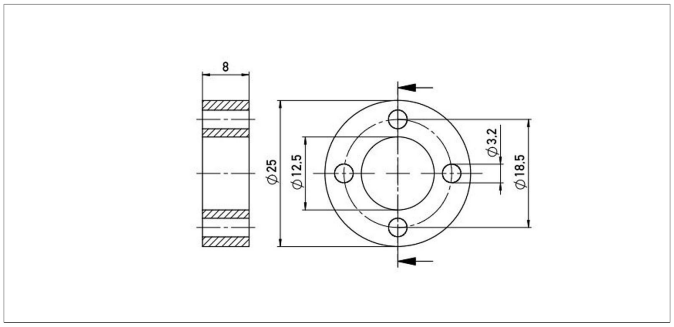
Connection Assignment

Signal	Connector code 106	Plug system code 4_ _
Supply voltage Ub	Pin 2	Pin 2
GND	Pin 3	Pin 3
CAN_H	Pin 4	Pin 4
CAN_L	Pin 5	Pin 5
Do not connect	Pin 1	Pin 1
	Connect cable shielding to protection earth	



Position Markers



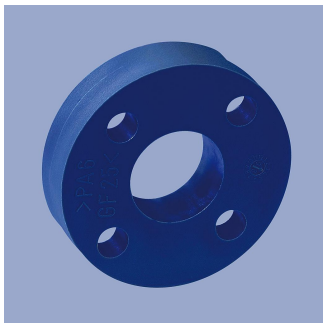


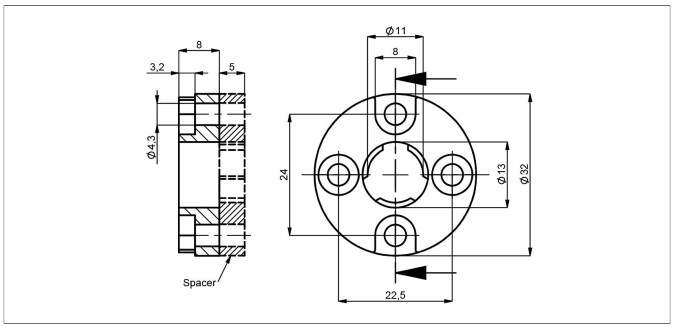
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





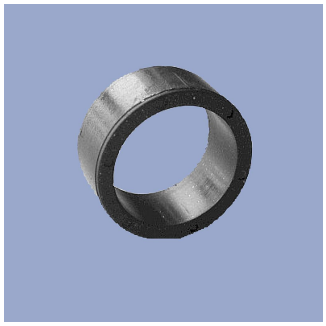
Z-TH1-P19

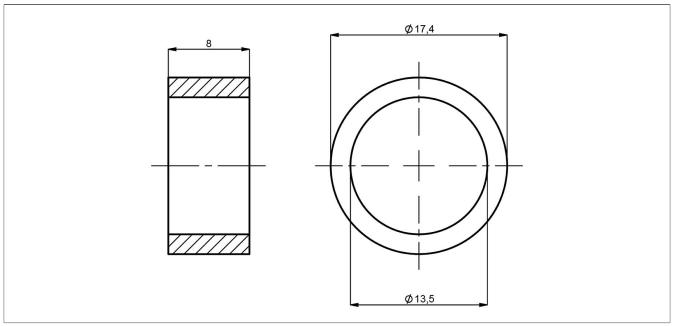
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



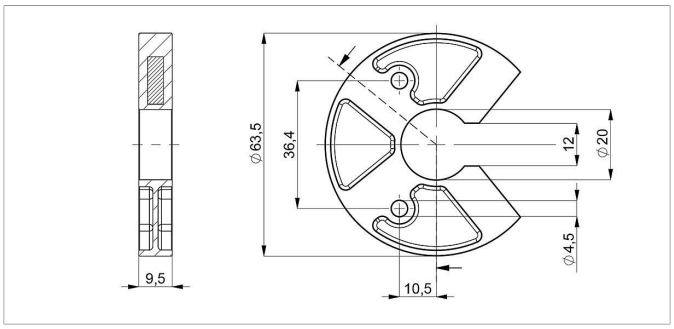


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

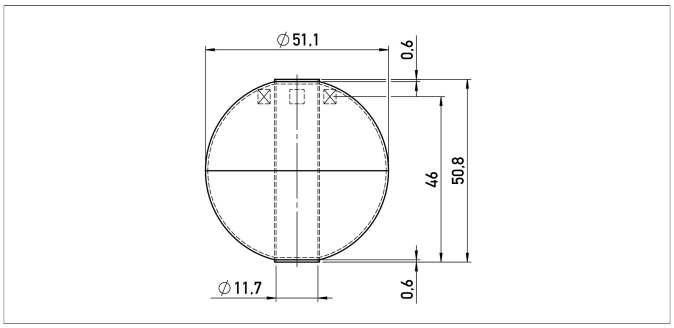
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

Position Markers

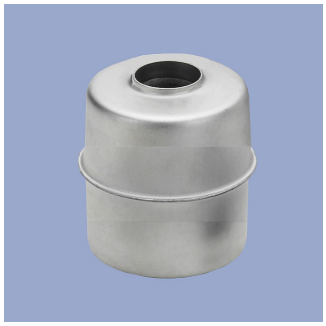


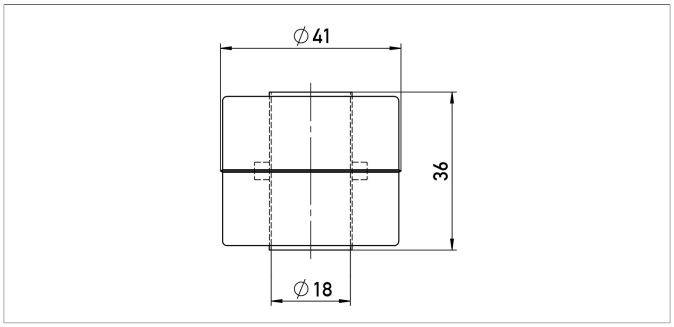
Z-TH1-P32

Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1



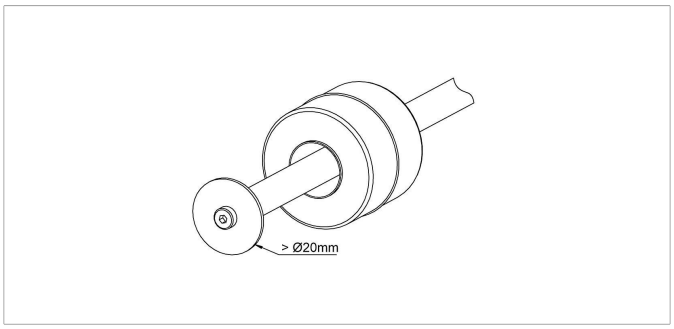


Z-TH1-P21

Cylinder floating position marker

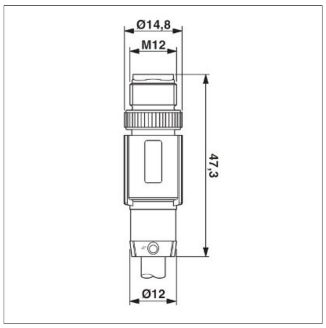
Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

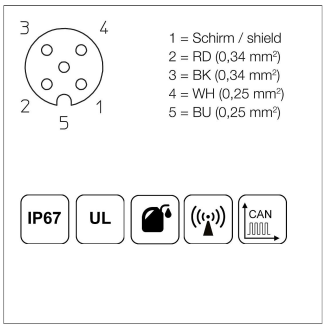
P/N	Pack. unit [pcs]
400056044	1



When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

Connector System M12

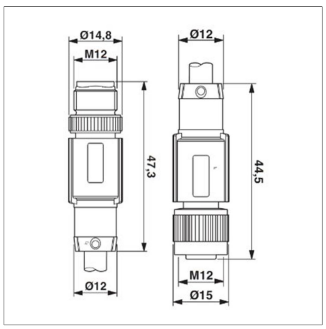


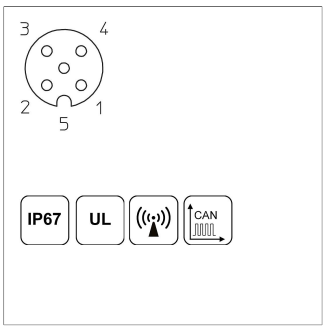


EEM-33-49/50/51
M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), open ended

Plug housing	TPU
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106368	EEM-33-49	2 m
400106371	EEM-33-50	5 m
400106372	EEM-33-51	10 m

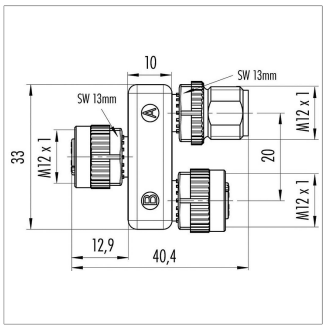


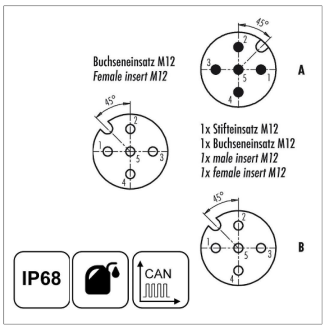


EEM-33-52
M12x1 Mating female/male connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), CAN-Bus

Plug housing	PUR
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (plug/socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106373	EEM-33-52	5 m

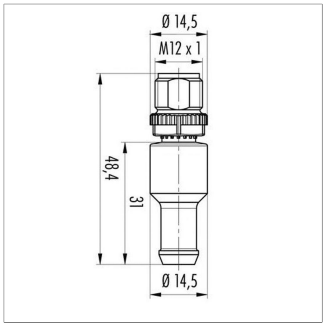


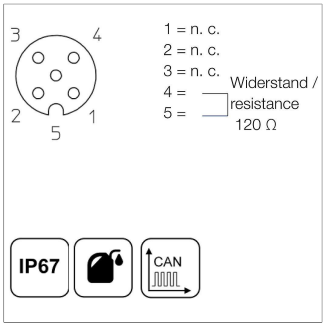


EEM-33-45
M12x1 splitter / T-connector, 5-pin, A-coded, IP68,1:1 connection, female - male - female, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056145	EEM-33-45





EEM-33-47
M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056147	EEM-33-47

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

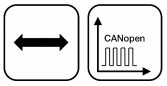
UL UL - approved

CAN CAN-Bus

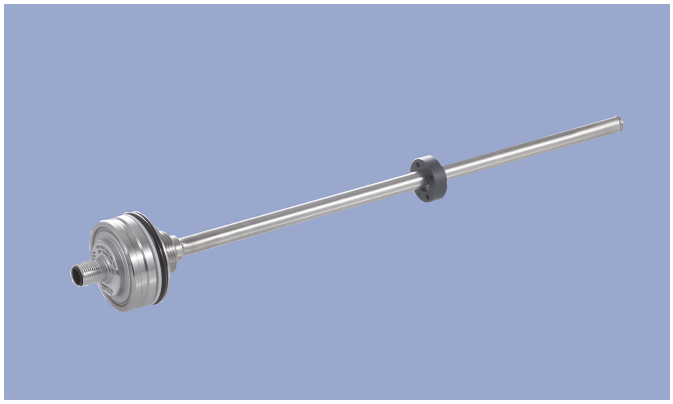
novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Plug-in Flange
CANopen
Industrial



CE



Special Features
- Compact design for tight spaces
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Non-contacting position detection with ring-shaped position marker
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in industrial applications
- Other configurations see separate data sheets

Applications
- Manufacturing Engineering
- Level measurement
- Actuators

The absolute linear transducer TM1 enables a compact and cost-effective position measurement. It consists of a stainless steel flange welded to a pressure-resistant rod and can therefore be used under harsh environmental conditions.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring FKM 80, Supporting ring: PTFE
Mounting	Plugged and secured in position with set screw M5 ISO 4026
Electrical connection	Connector M12x1, A-coded / Connector system M12x1, A-coded with lead wires

Mechanical Data	
Dimensions	See dimension drawing

Ordering Specifications

Ordering Specifications

Preferred types printed in bold

Interface
6: CANopen

Interface parameters
1: 1x position, 1x speed

Baud rate
1: 1000 kBaud
2: 800 kBaud
3: 500 kBaud
4: 250 kBaud
5: 125 kBaud
7: 50 kBaud

Electrical connection
106: Connector M12x1, 5-pin
468: Plug system M12x1, 5-pin, with lead wires 80 mm*
472: Plug system M12x1, 5-pin, with lead wires 120 mm*
476: Plug system M12x1, 5-pin, with lead wires 160 mm*
480: Plug system M12x1, 5-pin, with lead wires 200 mm*
484: Plug system M12x1, 5-pin, with lead wires 240 mm*
* Only for installation in a cylinder

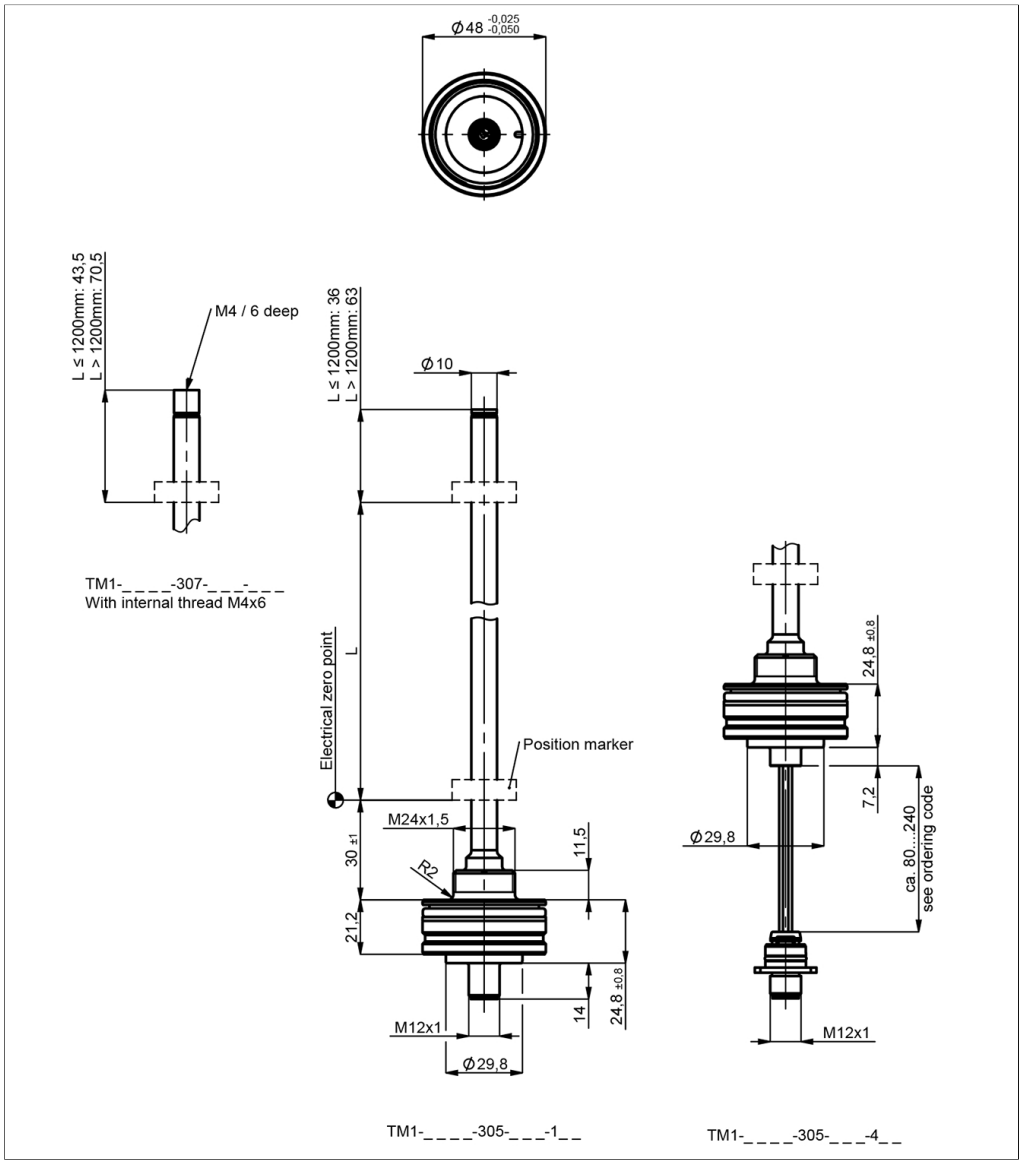
T M 1 – 0 5 0 0 – 3 0 5 – 6 1 4 – 1 0 6

Mechanical version
305: Plug-in flange Ø 48 mm
307: Plug-in flange Ø 48 mm with internal thread M4x6 at rod end, additional length 7.5 mm

Series

Electrical measuring range
Standard lengths 0050 up to 2000 mm in 25 mm-steps
Other lengths on request

Drawing


Ø48 -0,025 -0,050
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-307-_ _ _-_ _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
Electrical zero point
L
Position marker
M24x1,5
30 ±1
R2
11,5
21,2
14
24,8 ±0,8
M12x1
Ø29,8
TM1-_ _ _ _-305-_ _ _-1_ _
24,8 ±0,8
7,2
Ø29,8
ca. 80...240
see ordering code
M12x1
TM1-_ _ _ _-305-_ _ _-4_ _

Technical Data

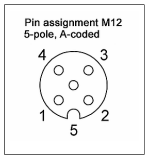
CANopen

Type	**TM1-_ _ _ _-305-6_ _-_ _ _**
	CANopen
Measured variables	Position, speed and temperature
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm
Measuring range speed	25 ... 1000 mm/s
Protocol	CANopen protocol to CiA DS-301 V4.2.0, Device profile DS-406 V3.2 Encoder Class C2, LSS services to CiA DS-305 V1.1.2
Programmable parameters	Position, speed, cams, working areas, temperature, node ID, baud rate
Node ID	1 ... 127 (default 127)
Baud rate	50 ... 1000 kBaud
Update rate (output)	1 kHz (internal measuring rate 0.5 kHz)
Resolution	≤ 0.1 mm
Resolution speed	2 mm/s
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)
Tolerance of electr. zero point	±1 mm
Repeatability	≤ ±0.1 mm
Hysteresis	≤ ±0.1 mm
Temperature error	≤ ±15 ppm/K (min. 0.01 mm/K)
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub
Power drain w/o load	< 1.5 W
Overvoltage protection	40 VDC (6 s)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (all outputs vs. GND and supply voltage)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	w/o (internal load resistance 120 Ω on request)
Environmental Data	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67 (Connector system M12, fastened, when correctly fitted in cylinder: IP69)
Operating temperature	-40 ... +105°C, -40 ... +85°C (connector system M12)
Operating humidity	0 ... 95 % R.H. (no condensation)
Working pressure	≤ 350 bar
Pressure peaks	≤ 450 bar
Burst pressure	> 700 bar
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	391 years
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
EMC Compatibility	
EN 61000-4-2 ESD (contact/air discharge)	4 kV, 8 kV
EN 61000-4-3 Electromagnetic fields (RFI)	10 V/m
EN 61000-4-4 Fast transients (burst)	1 kV
EN 61000-4-6 Cond. disturbances (HF fields)	10 V eff.
EN 55016-2-3 Radiated disturbances	Industrial and residential area
	Only for connector system M12: Data applies only inside a cylinder.
	The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.

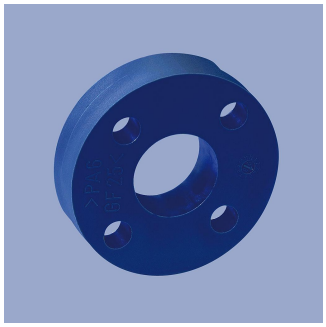
FS = Full scale: Signal span according to electrical measuring range

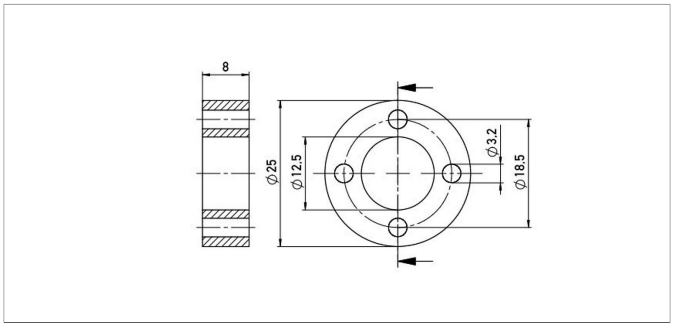
Connection Assignment

Signal	Connector code 106	Plug system code 4_ _
Supply voltage Ub	Pin 2	Pin 2
GND	Pin 3	Pin 3
CAN_H	Pin 4	Pin 4
CAN_L	Pin 5	Pin 5
Do not connect	Pin 1	Pin 1
	Connect cable shielding to protection earth	



Position Markers



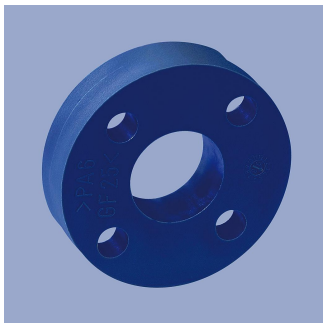


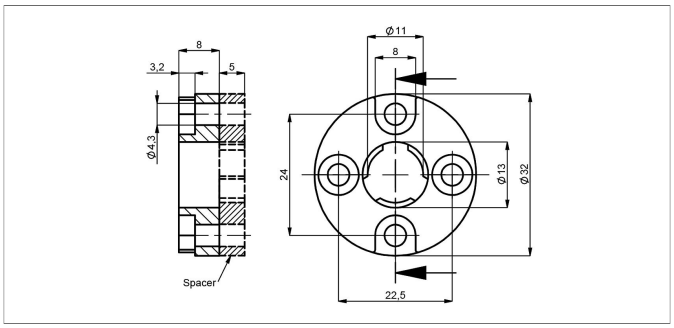
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





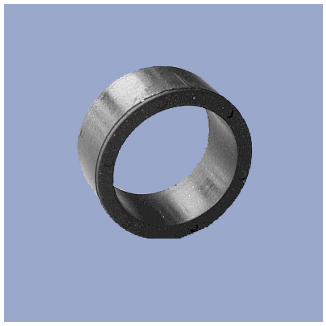
Z-TH1-P19

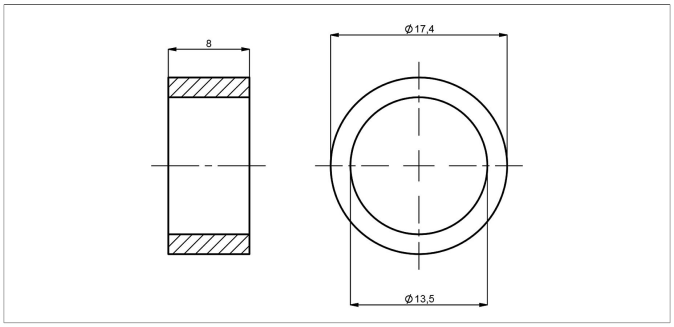
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



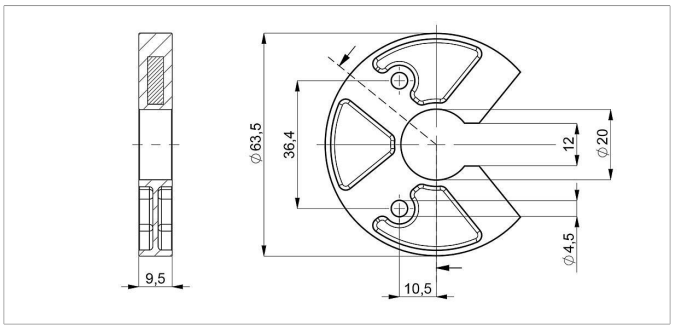


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

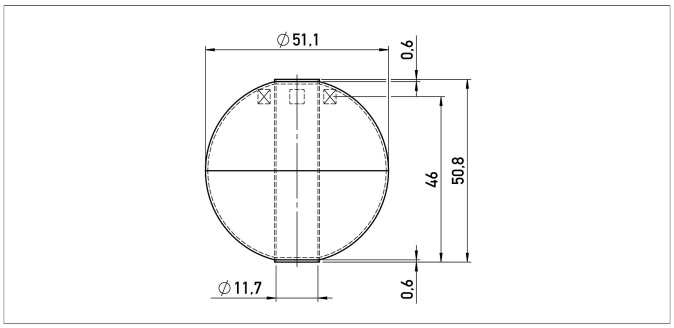
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

Position Markers

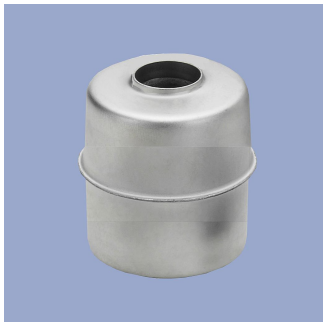


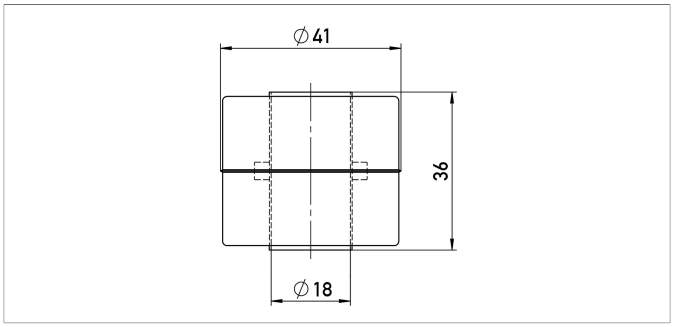
Z-TH1-P32

Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1



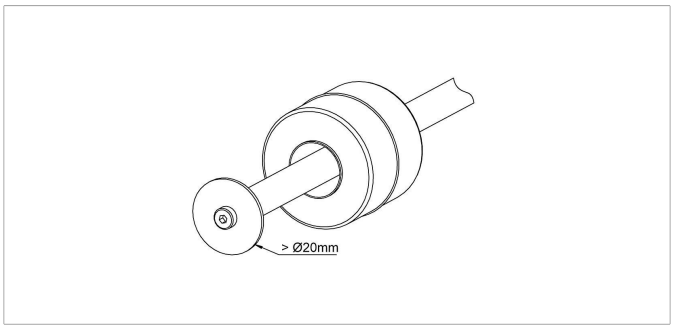


Z-TH1-P21

Cylinder floating position marker

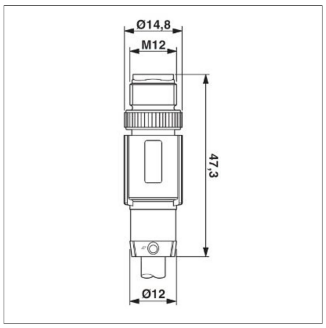
Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

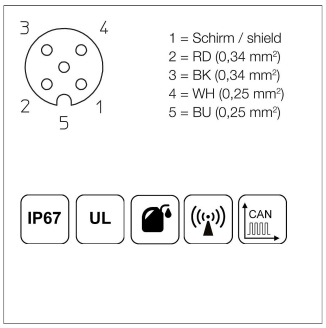
P/N	Pack. unit [pcs]
400056044	1



When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

Connector System M12

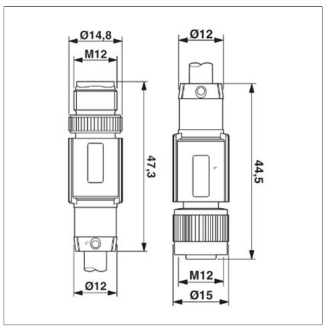


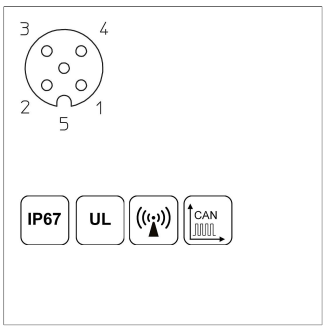


EEM-33-49/50/51
M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), open ended

Plug housing	TPU
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106368	EEM-33-49	2 m
400106371	EEM-33-50	5 m
400106372	EEM-33-51	10 m

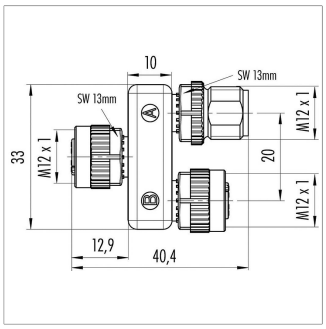


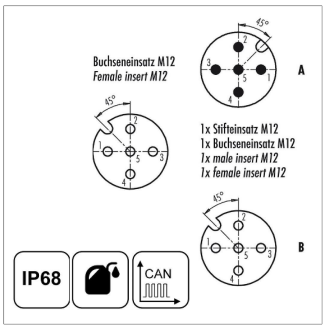


EEM-33-52
M12x1 Mating female/male connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), CAN-Bus

Plug housing	PUR
Cable sheath	PUR, Ø = 6.7 mm, -25 ... +90°C (plug/socket) -20 ... +80°C (cable)
Lead wires	PE, 2x0.25 mm²+2x0.34 mm²

P/N	Type	Length
400106373	EEM-33-52	5 m

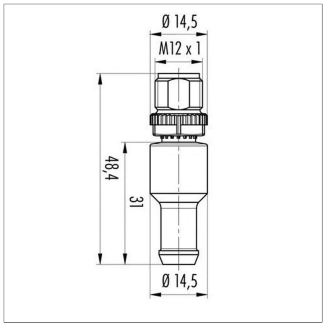


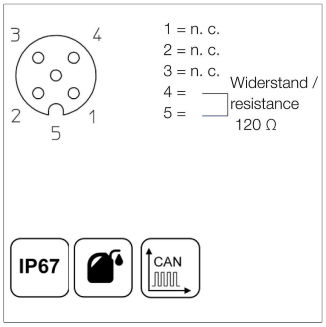


EEM-33-45
M12x1 splitter / T-connector, 5-pin, A-coded, IP68,1:1 connection, female - male - female, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056145	EEM-33-45





EEM-33-47
M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056147	EEM-33-47

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

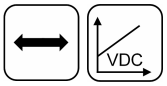
UL UL - approved

CAN CAN-Bus

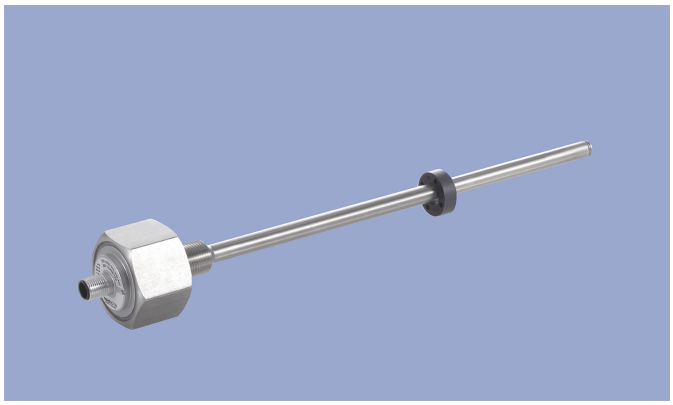
novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Screw flange
Voltage
Industrial



CE



Special Features
- Compact design for tight spaces
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Non-contacting position detection with ring-shaped position marker
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in industrial applications
- Other configurations see separate data sheets

Applications
- Manufacturing Engineering
- Level measurement
- Actuators

The absolute linear transducer TM1 enables a compact and cost-effective position measurement. It consists of a stainless steel flange welded to a pressure-resistant rod and can therefore be used under harsh environmental conditions.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

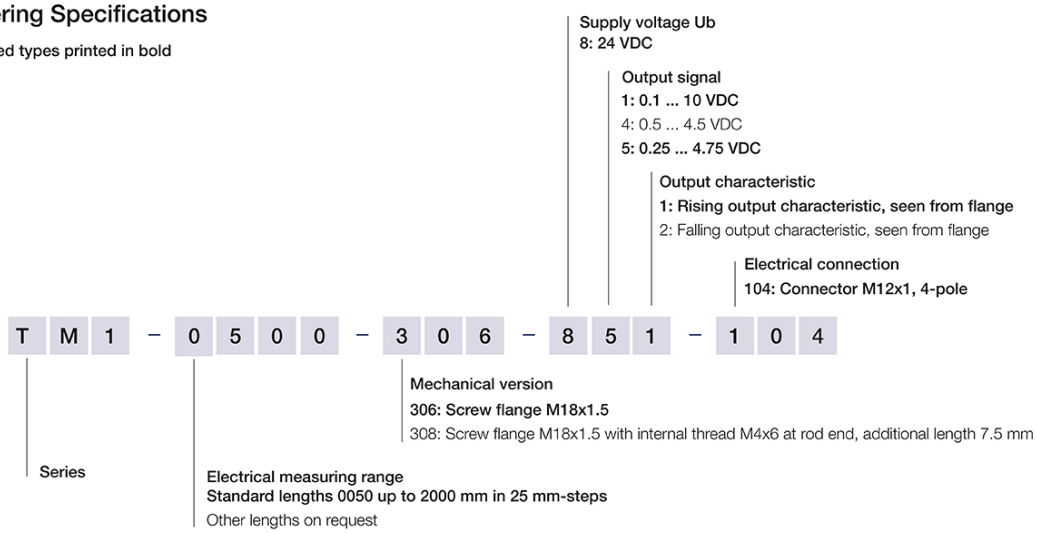
Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring NBR 90 SH A
Mounting	Screwed via thread M18x1.5
Electrical connection	Connector M12x1, A-coded

Mechanical Data	
Dimensions	See dimension drawing

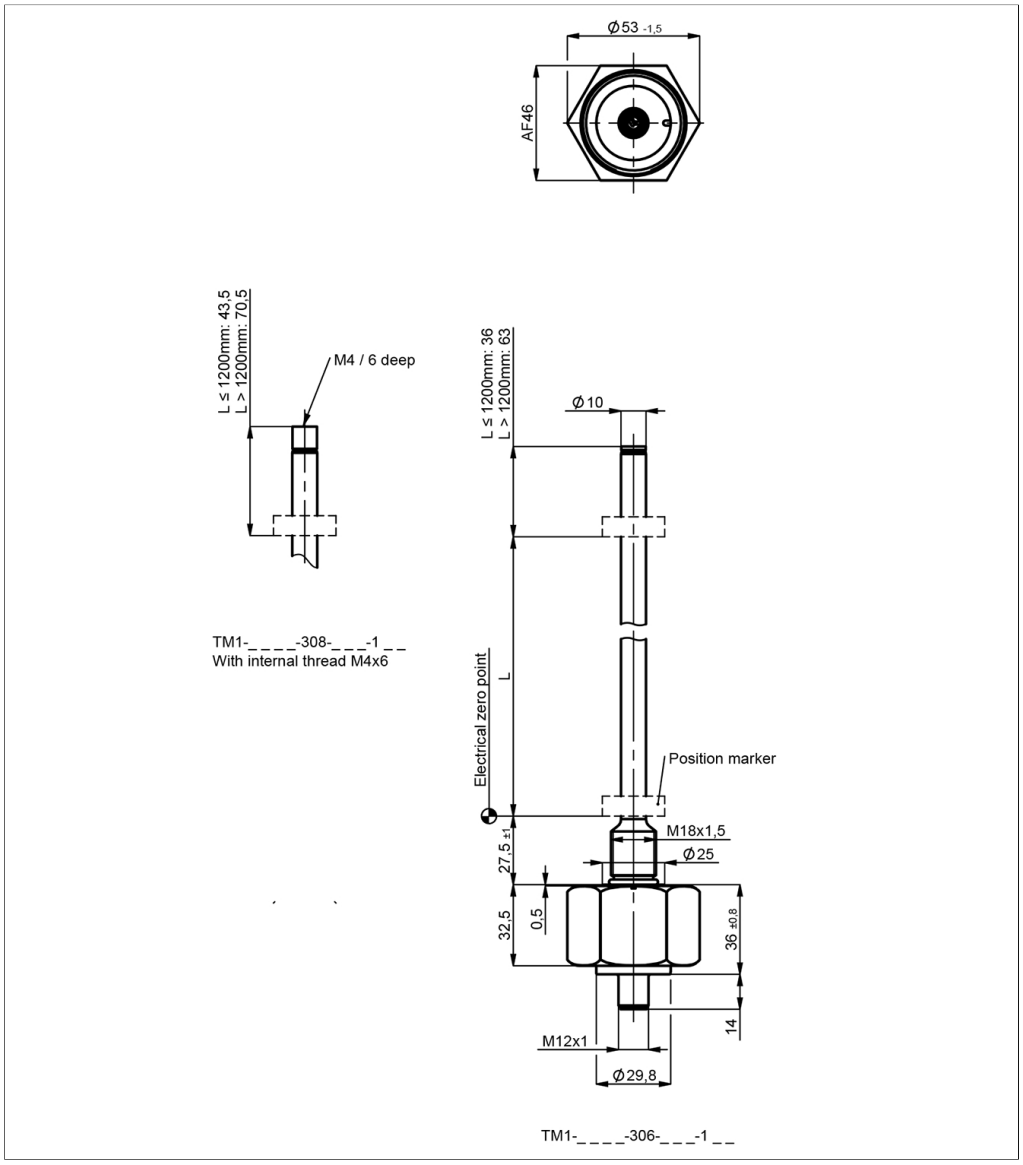
Ordering Specifications

Ordering Specifications

Preferred types printed in bold



Drawing


Ø53 -1,5
AF46
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-308-_ _ _-1 _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
L
Electrical zero point
Position marker
M18x1,5
Ø25
27,5 ±1
32,5
0,5
36 ±0,8
14
M12x1
Ø29,8
TM1-_ _ _ _-306-_ _ _-1 _ _

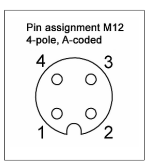
Technical Data

Type	**TM1-_ _ _ _-306-84_-104** **TM1-_ _ _ _-306-85_-104**	**TM1-_ _ _ _-306-81_-104**
Output signal	0.25 ... 4.75 V 0.5 ... 4.5 V	0.1 ... 10 V
Load	≥ 10 kΩ	
Sampling rate / Update rate	0.5 kHz	
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm	
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)	
Tolerance of electr. zero point	±1 mm	
Resolution	≤ 0.1 mm	
Repeatability	≤ ±0.1 mm	
Hysteresis	≤ ±0.1 mm	
Temperature error	typ. 50 ppm/K (min. 0.01 mm/K)	
Supply voltage Ub	12/24 VDC (8 ... 32 VDC)	24 VDC (16 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub	
Power drain w/o load	< 1 W	
Overvoltage protection	36 VDC (permanent)	
Polarity protection	yes (-36 VDC)	
Short circuit protection	yes (output vs GND and supply voltage up to 36 VDC)	
Insulation resistance (500 VDC)	≥ 10 MΩ	
Environmental Data		
Max. operational speed	Mechanically unlimited	
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm	
Shock IEC 60068-2-27	100 g, 11 ms (single hit)	
Protection class DIN EN 60529	IP67	
Operating temperature	-40 ... +105°C	
Operating humidity	0 ... 95 % R.H. (no condensation)	
Working pressure	≤ 350 bar	
Pressure peaks	≤ 450 bar	
Burst pressure	> 700 bar	
Life	Mechanically unlimited	
Functional safety	If you need assistance in using our products in safety-related systems, please contact us	
MTTF (IEC 60050)	346 years	346 years
EMC Compatibility		
EN 61000-4-2 ESD (contact/air discharge)	4 kV, 8 kV	
EN 61000-4-3 Electromagnetic fields (RFI)	10 V/m	
EN 61000-4-4 Fast transients (burst)	1 kV	
EN 61000-4-6 Cond. disturbances (HF fields)	10 V eff.	
EN 55016-2-3 Radiated disturbances	Industrial and residential area	

FS = Full scale: Signal span according to electrical measuring range

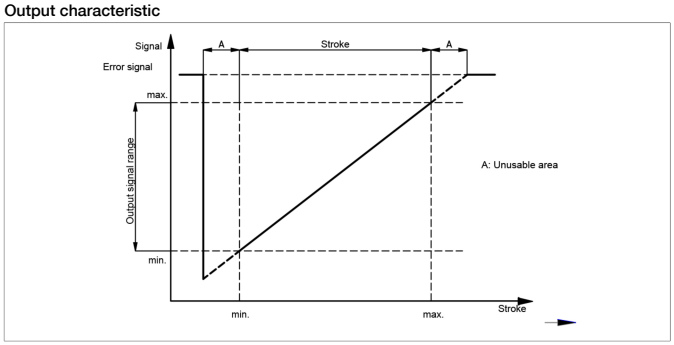
Connection Assignment

Signal	Connector code 1_ _
Supply voltage Ub	Pin 1
GND	Pin 3
Signal output	Pin 2
Do not connect	Pin 4
	Connect cable shielding to protection earth

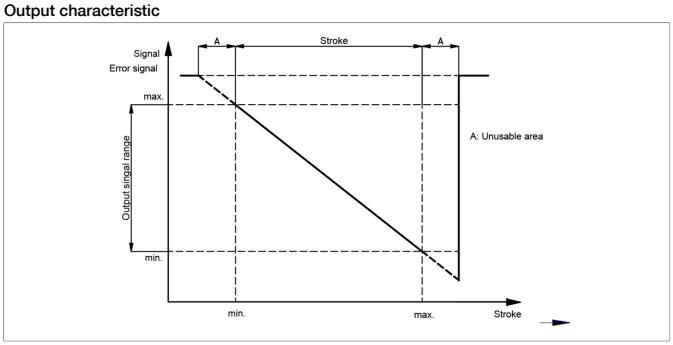


Technical Data
Output Characteristics

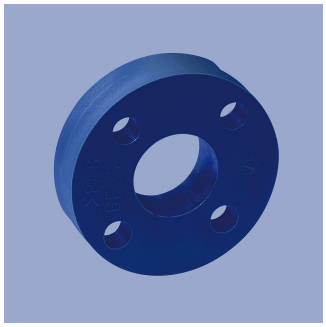
Output characteristic

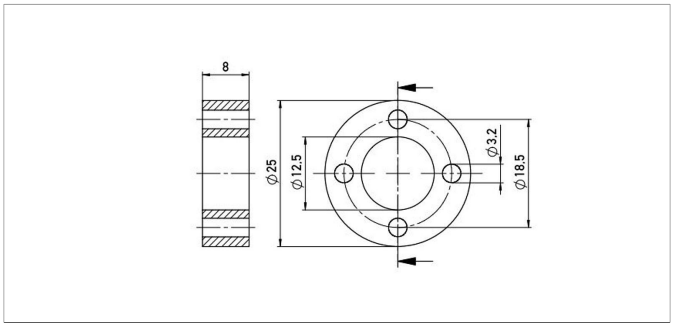


Output characteristic



Position Markers



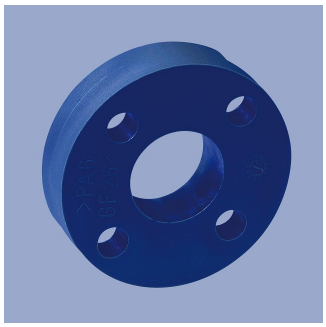


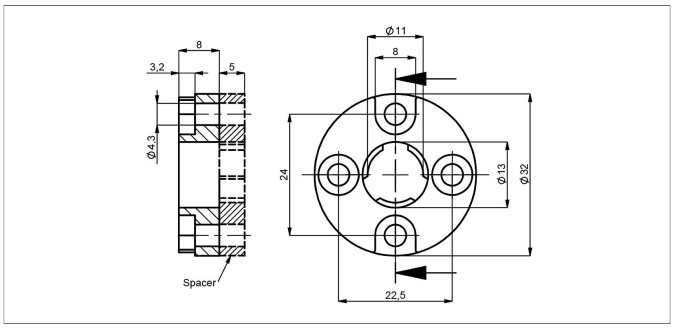
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





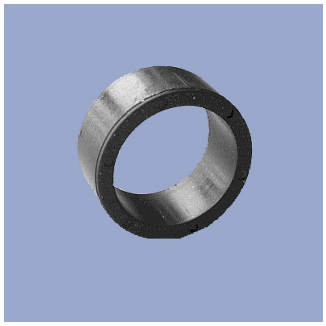
Z-TH1-P19

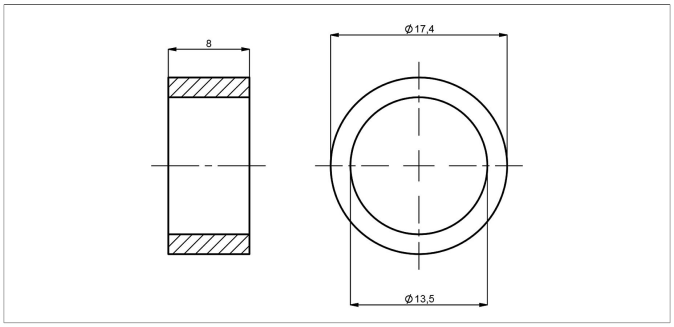
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



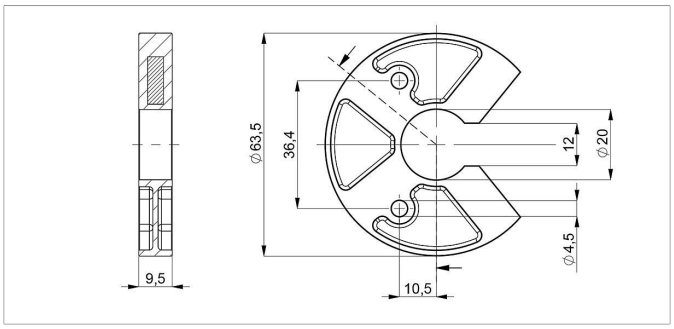


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

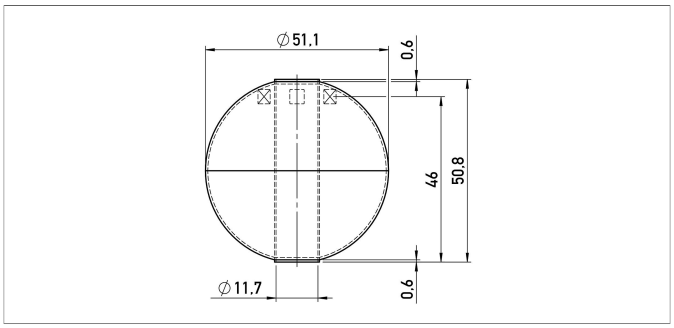
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

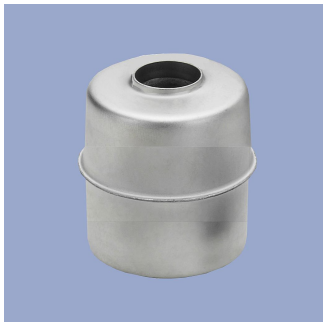
Position Markers

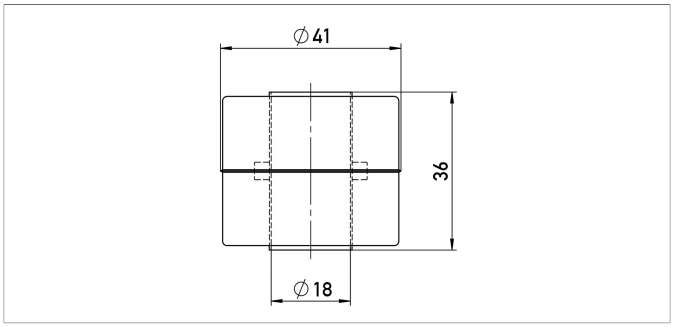


Z-TH1-P32
Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1

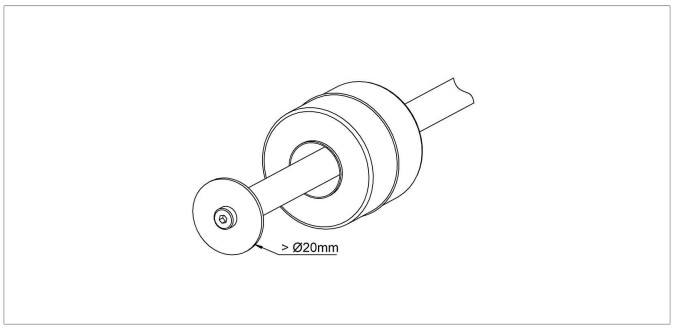




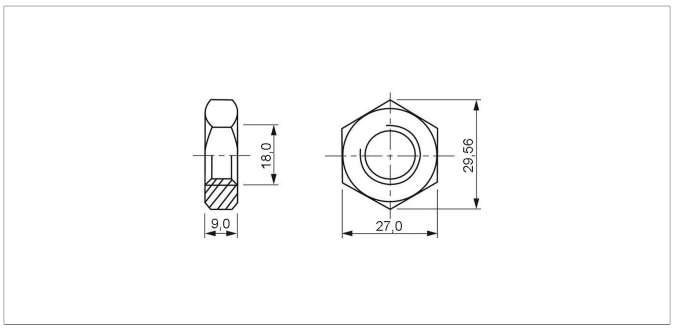
Z-TH1-P21
Cylinder floating position marker

Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

P/N	Pack. unit [pcs]
400056044	1



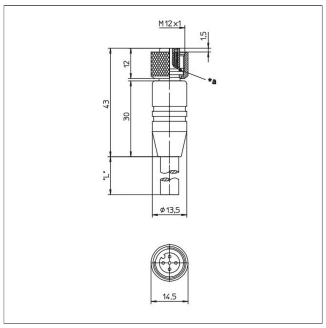
When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

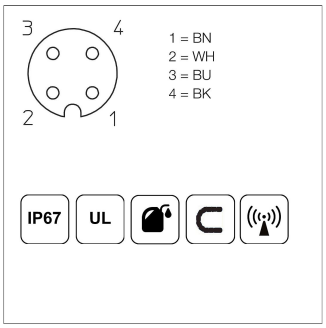


Z-TH1-M01
Lock nut ISO 8675, M18x1.5-A2

P/N	Pack. unit [pcs]
400056090	1

Connector System M12



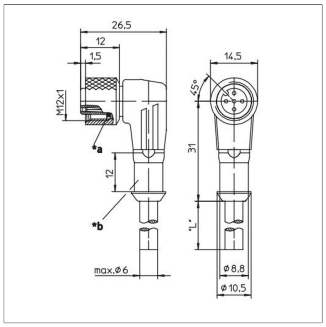


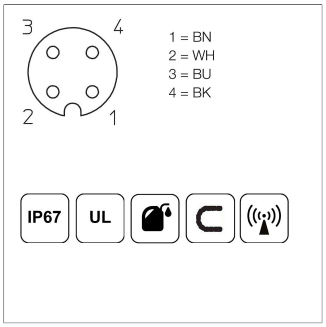
EEM-33-32/62/97

M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -25 ... +80°C (moved) -50 ... +80°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400005600	EEM-33-32	2 m
400005609	EEM-33-62	5 m
400005650	EEM-33-97	10 m





EEM-33-33/63/99

M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -25 ... +80°C (moved) -50 ... +80°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400005601	EEM-33-33	2 m
400005610	EEM-33-63	5 m
400005696	EEM-33-99	10 m

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

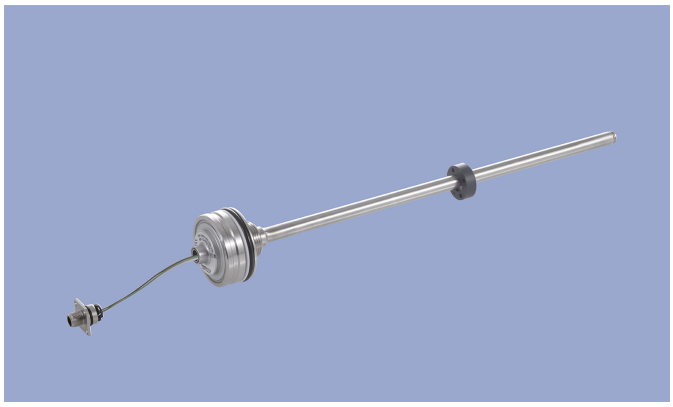
UL UL - approved

CAN CAN-Bus

novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Plug-in Flange
4 ... 20 mA
Mobile Applications



Special Features
- For integration in pneumatic and hydraulic cylinders
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Ring-shaped position marker does not contact sensor
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in mobile applications with highest EMC requirements such as ISO pulses and high interferences to ISO 11452, exceeds E1 requirements
- Other configurations see separate data sheets

Applications
Hydraulic or pneumatic cylinders in
- Agricultural and forestry machinery
- Construction machines
- Vehicles with loading and unloading devices
- Vehicles with extension arms

The absolute position transducer can be used directly in-cylinder and thus enables a compact and cost-effective position measurement. The sensor consists of a stainless steel flange welded to a pressure tight rod and can therefore be used in harsh environments.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring FKM 80, Supporting ring: PTFE
Mounting	Plugged into cylinders, secured in position with set screw M5 ISO 4026
Electrical connection	Cable 3x 0.5 mm² (AWG 20), PUR, unshielded / Connector M12x1, A-coded / Connector system M12x1, A-coded with lead wires

Mechanical Data	
Dimensions	See dimension drawing

Ordering Specifications

Ordering specifications

Preferred types printed in bold

Supply voltage Ub
8: Ub = 12/24 VDC

Output signal
2: 4 ... 20 mA

Output characteristic
1: Rising output characteristic, seen from flange
2: Falling output characteristic, seen from flange

Electrical connection
104: Connector M12x1, 4-pin
251: Cable, 3-pole, unshielded, A = 1 m
253: Cable, 3-pole, unshielded, A = 3 m
255: Cable, 3-pole, unshielded, A = 5 m
438: Plug system M12x1, 4-pin, with lead wires 80 mm
442: Plug system M12x1, 4-pin, with lead wires 120 mm
446: Plug system M12x1, 4-pin, with lead wires 160 mm
450: Plug system M12x1, 4-pin, with lead wires 200 mm
454: Plug system M12x1, 4-pin, with lead wires 240 mm

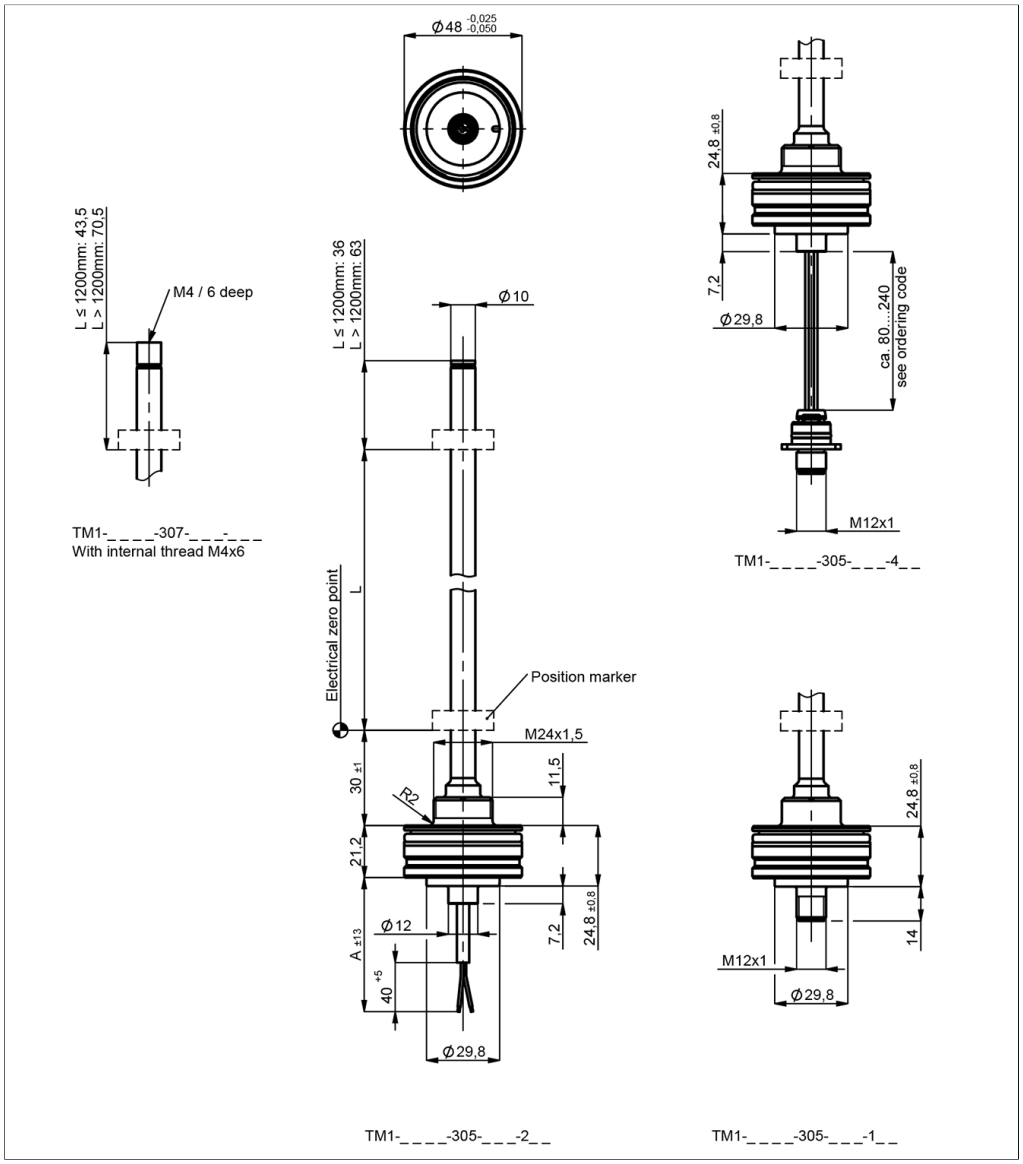
T M 1 – 0 5 0 0 – 3 0 5 – 8 2 1 – 4 4 2

Mechanical version
305: Plug-in flange Ø 48 mm
307: Plug-in flange Ø 48 mm with internal thread M4x6 at rod end, additional length 7.5 mm

Series

Electrical measuring range
Standard lengths 0050 up to 2000 mm in 25 mm-steps
Other lengths on request

Drawing


Ø48 -0,025 -0,050
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-307-_ _ _-_ _ _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
Electrical zero point
L
Position marker
M24x1,5
30 ±1
R2
11,5
21,2
A ±13
Ø12
7,2
24,8 ±0,8
40 +5
Ø29,8
TM1-_ _ _ _-305-_ _ _-2_ _
24,8 ±0,8
7,2
Ø29,8
ca. 80...240
see ordering code
M12x1
TM1-_ _ _ _-305-_ _ _-4_ _
24,8 ±0,8
14
M12x1
Ø29,8
TM1-_ _ _ _-305-_ _ _-1_ _

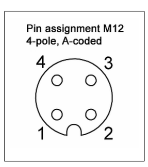
Technical Data

Type	**TM1-_ _ _ _-305-82_-_ _ _**
Output signal	4 ... 20 mA
Burden	@Ub 24 V: ≤ 500 Ω, @Ub 12 V: ≤ 250 Ω
Sampling rate / Update rate	0.5 kHz
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)
Tolerance of electr. zero point	±1 mm
Resolution	≤ 0.1 mm
Repeatability	≤ ±0.1 mm
Hysteresis	≤ ±0.1 mm
Temperature error	typ. 50 ppm/K (min. 0.01 mm/K)
Supply voltage Ub	12/24 VDC (8 ... 32 VDC)
Supply voltage ripple	≤ 10% Ub
Power drain w/o load	< 1 W
Overvoltage protection	36 VDC (permanent)
Polarity protection	yes (-36 VDC)
Short circuit protection	yes (output vs GND and supply voltage up to 36 VDC)
Insulation resistance (500 VDC)	≥ 10 MΩ
Environmental Data	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67 (Connector system M12, fastened, when correctly fitted in cylinder: IP69)
Operating temperature	-40 ... +105°C (connector M12 / cable), -40 ... +85°C (connector system M12)
Operating humidity	0 ... 95 % R.H. (no condensation)
Working pressure	≤ 350 bar
Pressure peaks	≤ 450 bar
Burst pressure	> 700 bar
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	355 years
EMC Compatibility	
ISO 10605 ESD (Handling/Component)	8 kV / 15 kV
ISO 11452-2 Radiated HF-fields	100 V/m
ISO 11452-4 BCI (Bulk current injection)	200 mA
CISPR 25 Radiated emission	Level 4
ISO 7637-2 Transient Emissions	Level 1/2
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b) Level 4
ISO 7637-3 Pulses on output lines	(3a, 3b) Fast Level 2
ISO 16750 Pulses on supply lines	Starting profile Level 4 @12 V / Level 3 @24 V, Load dump A +200 V
EN 13309 Construction machinery	
ISO 14982 Agricult./forestry machines	
Emission/Immunity	Exceeds E1 requirements
	The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.

FS = Full scale: Signal span according to electrical measuring range

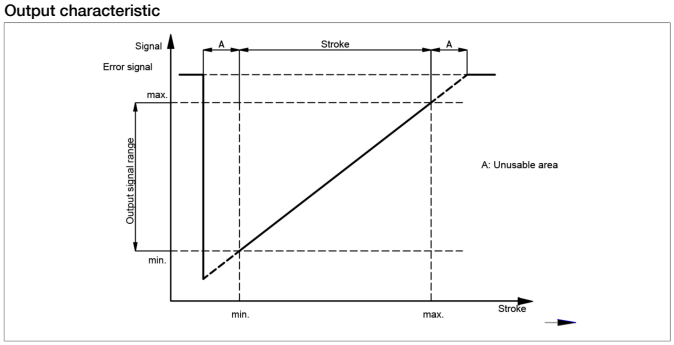
Connection Assignment

Signal	Cable code 2_ _	Connector code 1_ _	Plug system code 4_ _
Supply voltage Ub	BN	Pin 1	Pin 1
GND	WH	Pin 3	Pin 3
Signal output	GN	Pin 2	Pin 2
Do not connect	-	Pin 4	Pin 4

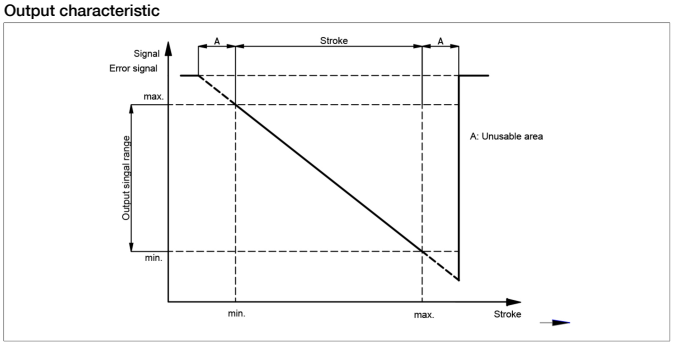


Technical Data
Output Characteristics

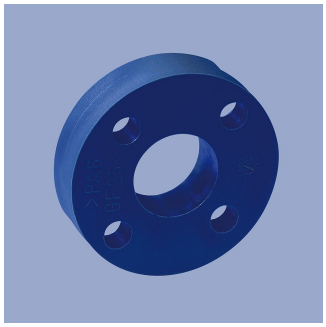
Output characteristic

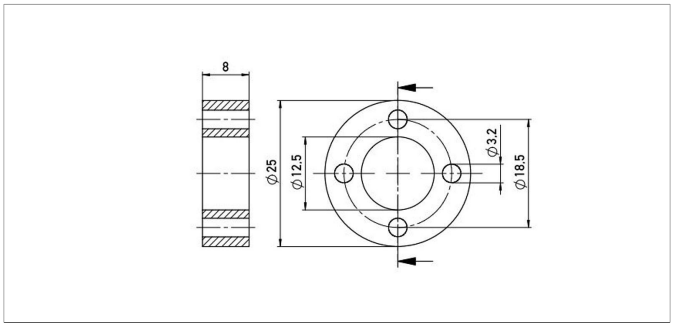


Output characteristic



Position Markers



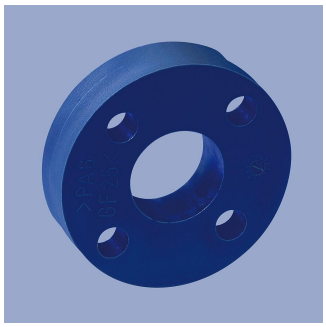


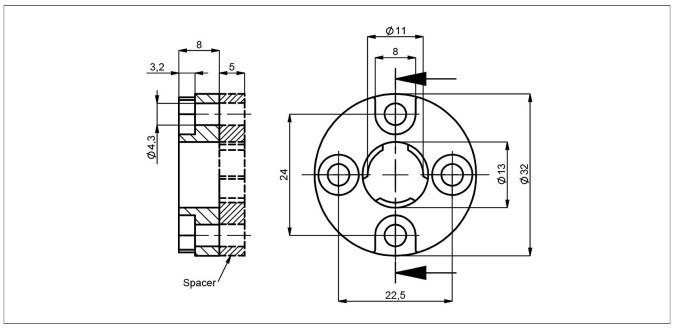
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





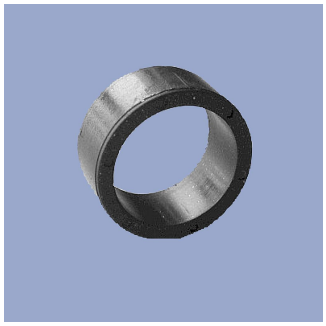
Z-TH1-P19

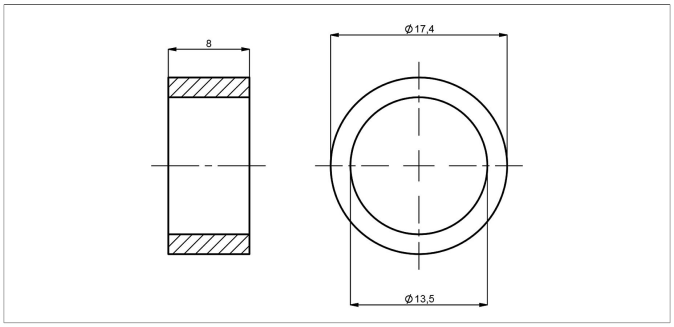
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



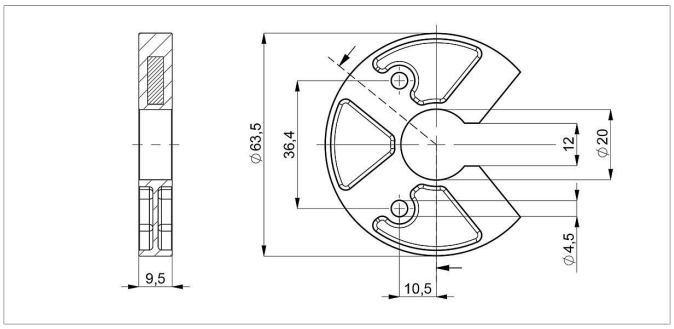


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

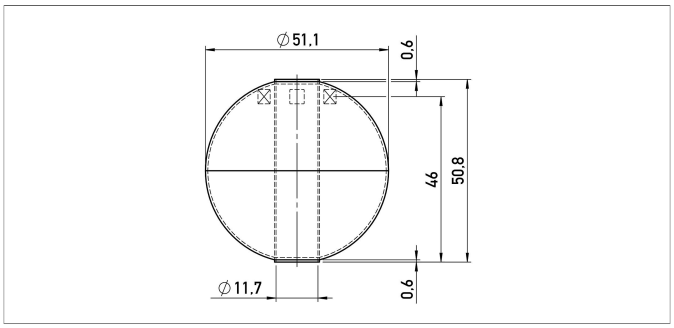
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

Position Markers

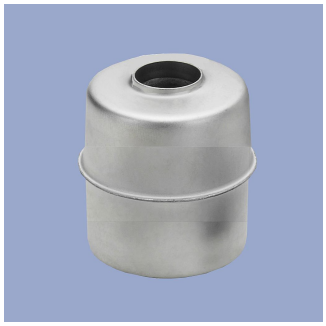


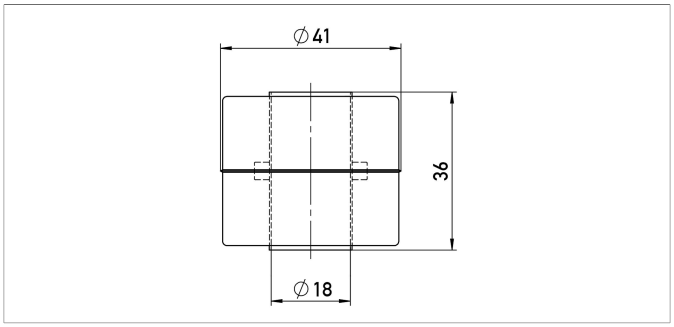
Z-TH1-P32

Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1



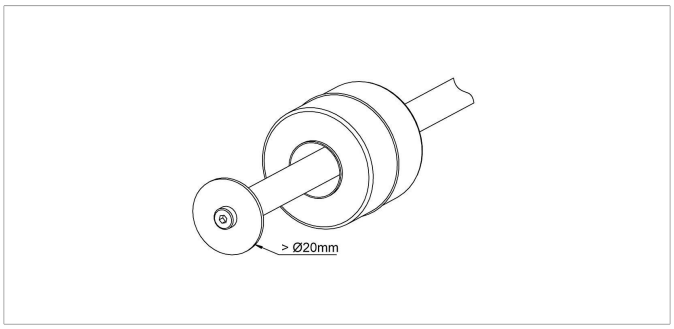


Z-TH1-P21

Cylinder floating position marker

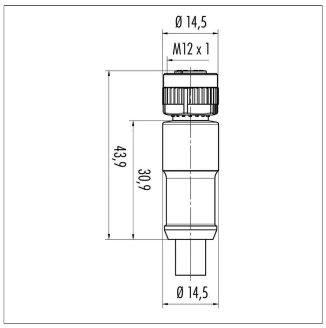
Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

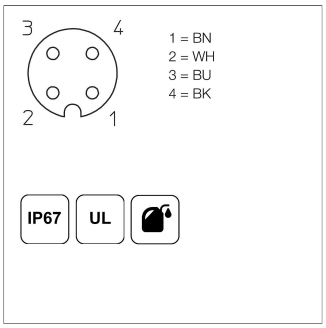
P/N	Pack. unit [pcs]
400056044	1



When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

Connector System M12



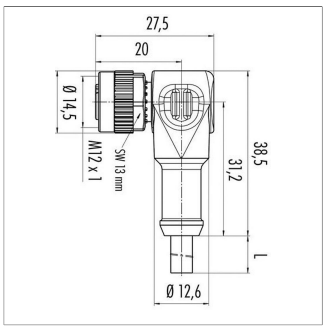


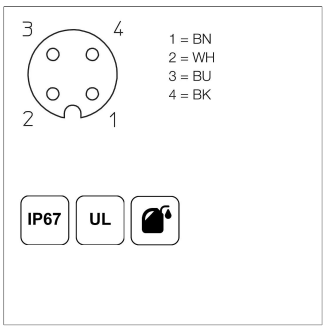
EEM-33-35/36/37

M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, not shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -40 ... +85°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400056135	EEM-33-35	2 m
400056136	EEM-33-36	5 m
400056137	EEM-33-37	10 m



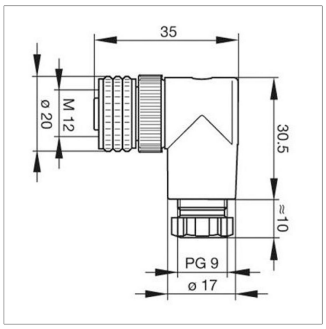


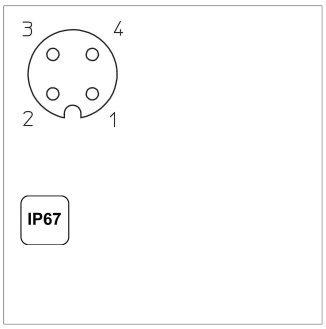
EEM-33-38/39/40

M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, not shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -40 ... +85°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400056138	EEM-33-38	2 m
400056139	EEM-33-39	5 m
400056140	EEM-33-40	10 m





EEM-33-89

M12x1 Mating female connector, 4-pin, angled, A-coded, with coupling nut, screw termination, IP67, not shieldable

Operating temp.	-25 ... +90°C
Plug housing	PBT
For wire gauge	6 ... 8 mm, max. 0.75 mm²

P/N	Type
400005634	EEM-33-89

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

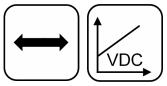
UL - approved

CAN CAN-Bus

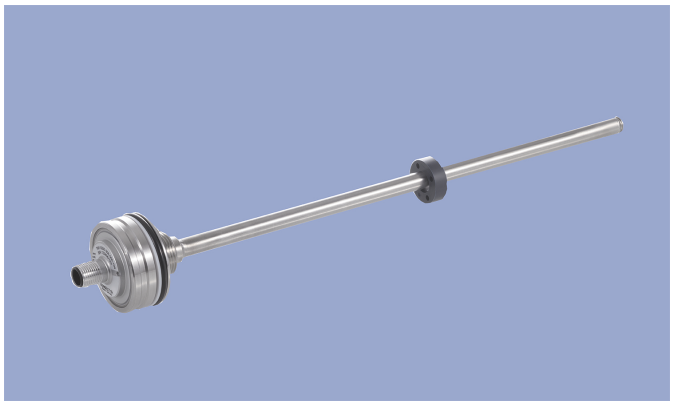
novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Plug-in Flange
Voltage
Industrial



CE



Special Features
- Compact design for tight spaces
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Non-contacting position detection with ring-shaped position marker
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in industrial applications
- Other configurations see separate data sheets

Applications
- Manufacturing Engineering
- Level measurement
- Actuators

The absolute linear transducer TM1 enables a compact and cost-effective position measurement. It consists of a stainless steel flange welded to a pressure-resistant rod and can therefore be used under harsh environmental conditions.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring FKM 80, Supporting ring: PTFE
Mounting	Plugged and secured in position with set screw M5 ISO 4026
Electrical connection	Connector M12x1, A-coded / Connector system M12x1, A-coded with lead wires

Mechanical Data	
Dimensions	See dimension drawing

Ordering Specifications

Ordering Specifications

Preferred types printed in bold

Supply voltage Ub
8: Ub = 24 VDC

Output signal
1: 0.1 ... 10 VDC
4: 0.5 ... 4.5 VDC
5: 0.25 ... 4.75 VDC

Output characteristic
1: Rising output characteristic, seen from flange
2: Falling output characteristic, seen from flange

Electrical connection
104: Connector M12x1, 4-pin
438: Plug system M12x1, 4-pin, with lead wires 80 mm*
442: Plug system M12x1, 4-pin, with lead wires 120 mm*
446: Plug system M12x1, 4-pin, with lead wires 160 mm*
450: Plug system M12x1, 4-pin, with lead wires 200 mm*
454: Plug system M12x1, 4-pin, with lead wires 240 mm*
* Only for installation in a cylinder

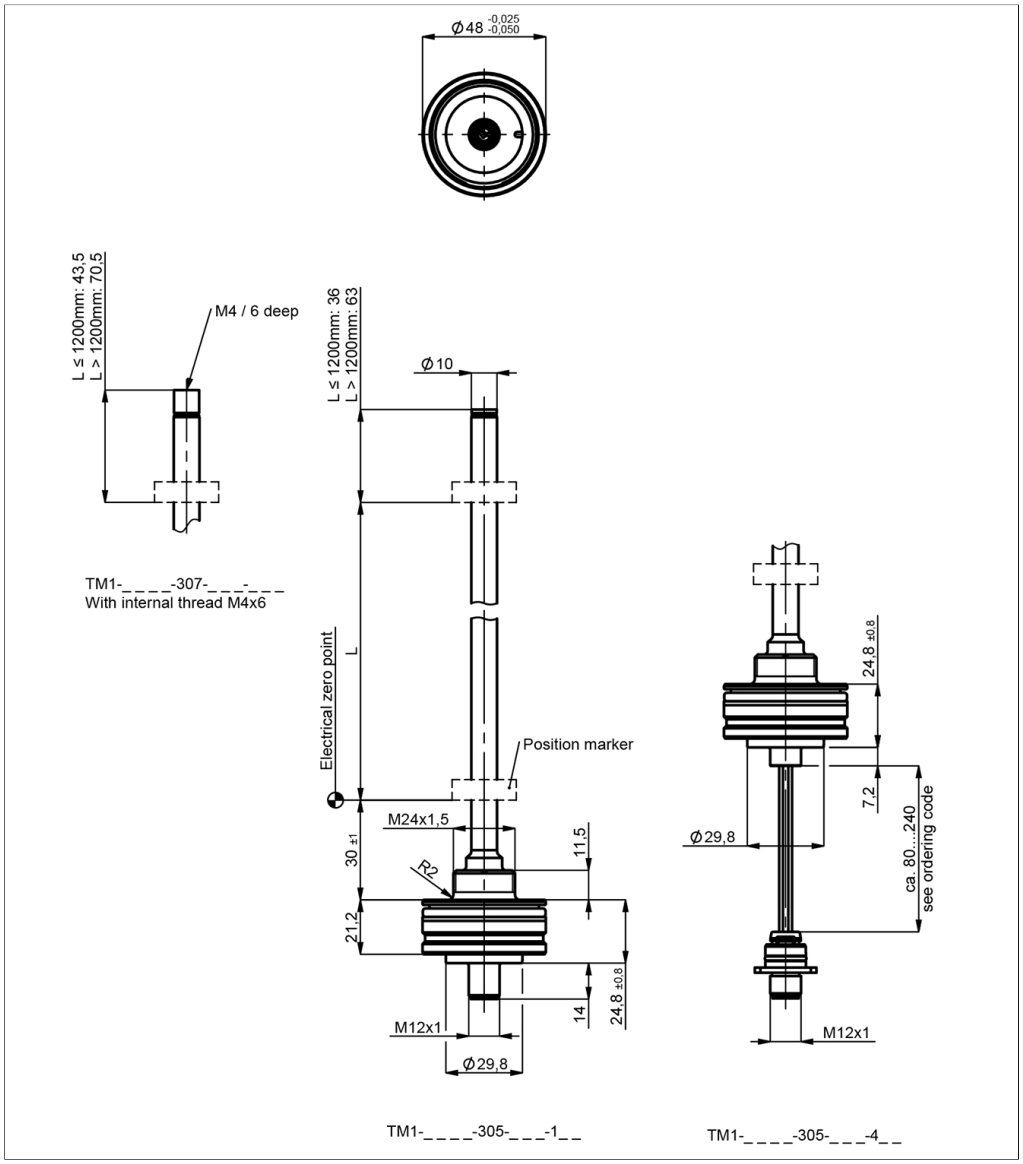
T M 1 – 0 5 0 0 – 3 0 5 – 8 1 1 – 1 0 4

Mechanical version
305: Plug-in flange Ø 48 mm
307: Plug-in flange Ø 48 mm with internal thread M4x6 at rod end, additional length 7.5 mm

Series

Electrical measuring range
Standard lengths 0050 up to 2000 mm in 25 mm-steps
Other lengths on request

Drawing


Ø48 -0,025 -0,050
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-307-_ _ _-_ _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
Electrical zero point
L
Position marker
M24x1,5
30 ±1
R2
11,5
21,2
14
24,8 ±0,8
M12x1
Ø29,8
TM1-_ _ _ _-305-_ _ _-1_ _
24,8 ±0,8
7,2
Ø29,8
ca. 80...240
see ordering code
M12x1
TM1-_ _ _ _-305-_ _ _-4_ _

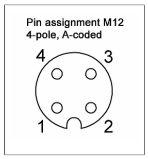
Technical Data

Type	**TM1-_ _ _ _-305-84_-_ _ _** **TM1-_ _ _ _-305-85_-_ _ _**	**TM1-_ _ _ _-305-81_-_ _ _**
Output signal	0.25 ... 4.75 V 0.5 ... 4.5 V	0.1 ... 10 V
Load	≥ 10 kΩ	
Sampling rate / Update rate	0.5 kHz	
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm	
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)	
Tolerance of electr. zero point	±1 mm	
Resolution	≤ 0.1 mm	
Repeatability	≤ ±0.1 mm	
Hysteresis	≤ ±0.1 mm	
Temperature error	typ. 50 ppm/K (min. 0.01 mm/K)	
Supply voltage Ub	12/24 VDC (8 ... 32 VDC)	24 VDC (16 ... 34 VDC)
Supply voltage ripple	≤ 10% Ub	
Power drain w/o load	< 1 W	
Overvoltage protection	36 VDC (permanent)	
Polarity protection	yes (-36 VDC)	
Short circuit protection	yes (output vs GND and supply voltage up to 36 VDC)	
Insulation resistance (500 VDC)	≥ 10 MΩ	
Environmental Data		
Max. operational speed	Mechanically unlimited	
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm	
Shock IEC 60068-2-27	100 g, 11 ms (single hit)	
Protection class DIN EN 60529	IP67 (Connector system M12, fastened, when correctly fitted in cylinder: IP69)	
Operating temperature	-40 ... +105°C, -40 ... +85°C (connector system M12)	
Operating humidity	0 ... 95 % R.H. (no condensation)	
Working pressure	≤ 350 bar	
Pressure peaks	≤ 450 bar	
Burst pressure	> 700 bar	
Life	Mechanically unlimited	
Functional safety	If you need assistance in using our products in safety-related systems, please contact us	
MTTF (IEC 60050)	346 years	346 years
EMC Compatibility		
EN 61000-4-2 ESD (contact/air discharge)	4 kV, 8 kV	
EN 61000-4-3 Electromagnetic fields (RFI)	10 V/m	
EN 61000-4-4 Fast transients (burst)	1 kV	
EN 61000-4-6 Cond. disturbances (HF fields)	10 V eff.	
EN 55016-2-3 Radiated disturbances	Industrial and residential area	
	Only for connector system M12: Data applies only inside a cylinder.	
	The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.	

FS = Full scale: Signal span according to electrical measuring range

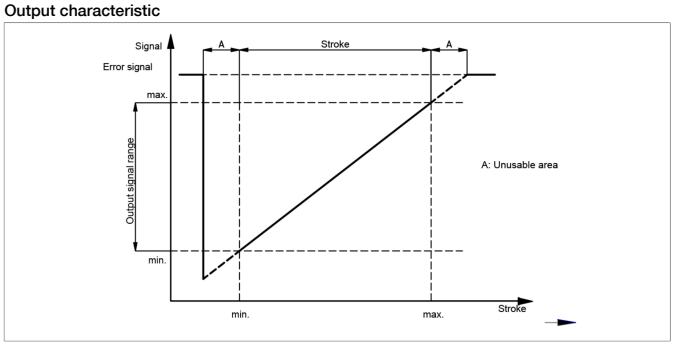
Connection Assignment

Signal	Connector code 1_ _	Plug system code 4_ _
Supply voltage Ub	Pin 1	Pin 1
GND	Pin 3	Pin 3
Signal output	Pin 2	Pin 2
Do not connect	Pin 4	Pin 4
	Connect cable shielding to protection earth	

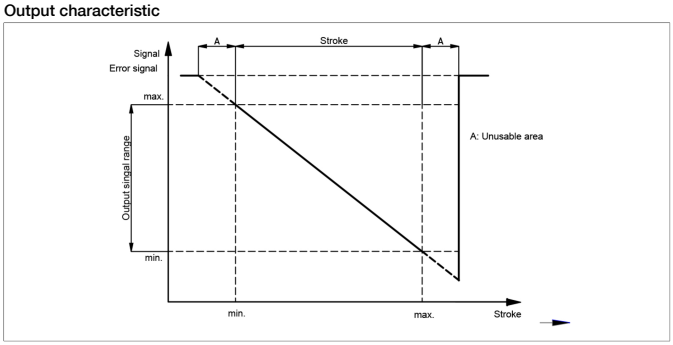


Technical Data
Output Characteristics

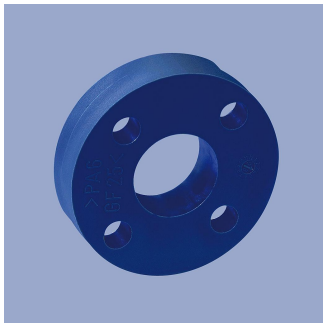
Output characteristic

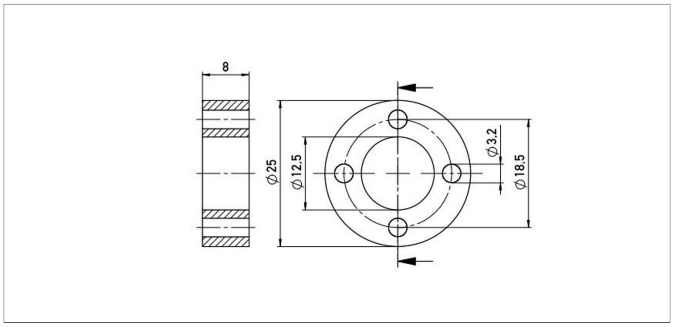


Output characteristic



Position Markers



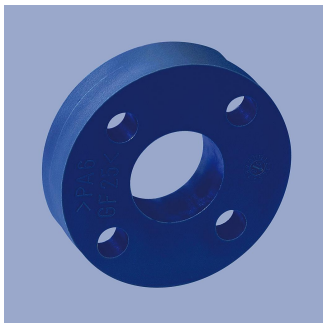


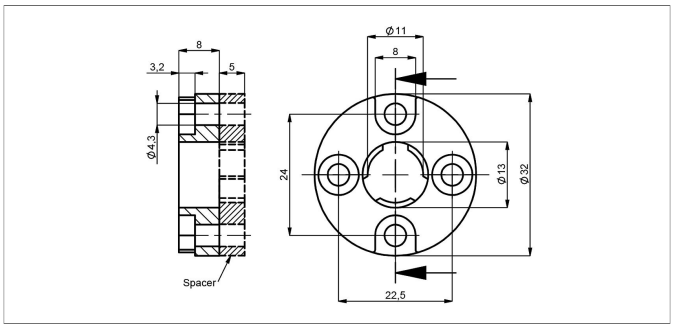
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





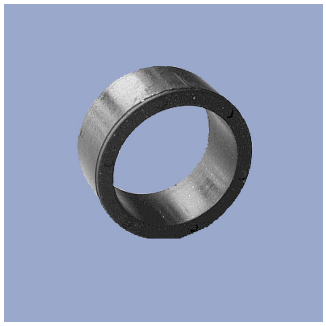
Z-TH1-P19

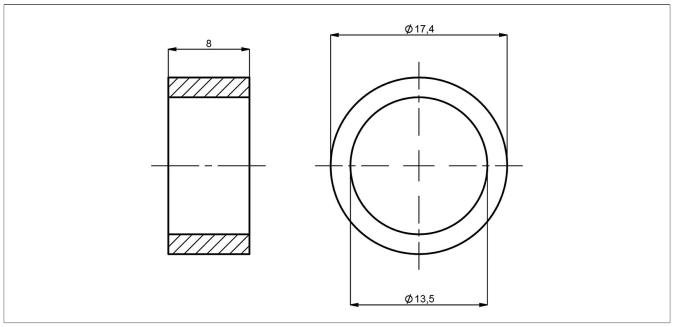
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



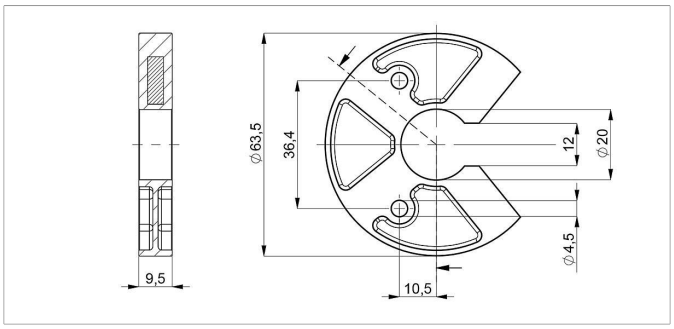


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

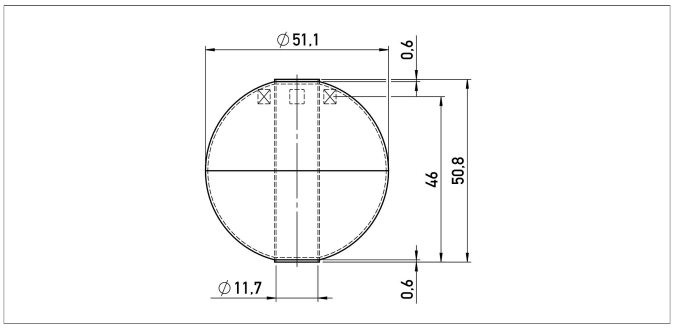
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

Position Markers

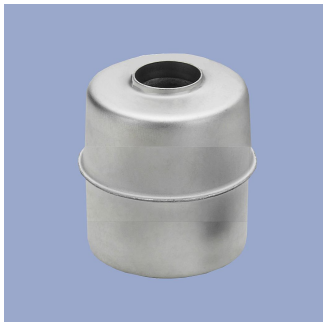


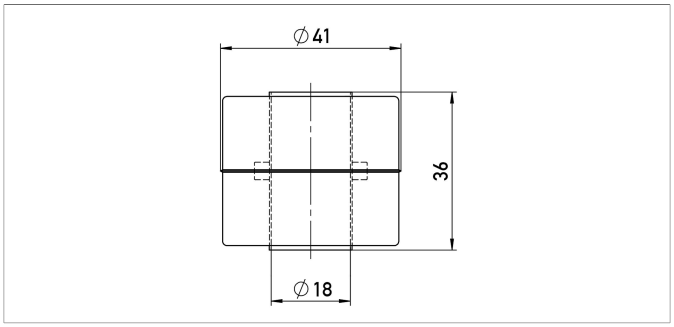
Z-TH1-P32

Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1



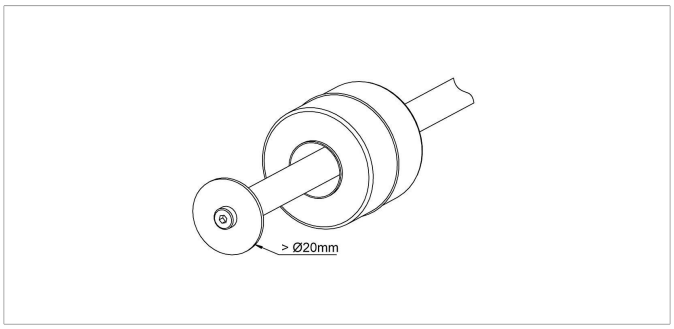


Z-TH1-P21

Cylinder floating position marker

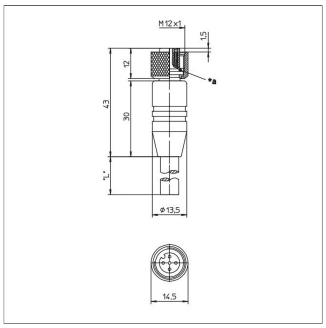
Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

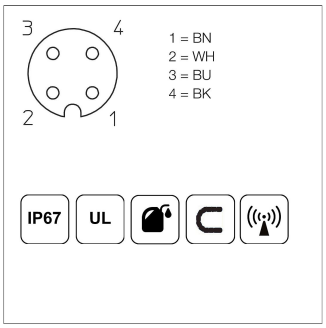
P/N	Pack. unit [pcs]
400056044	1



When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

Connector System M12



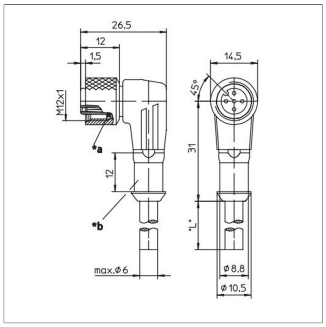


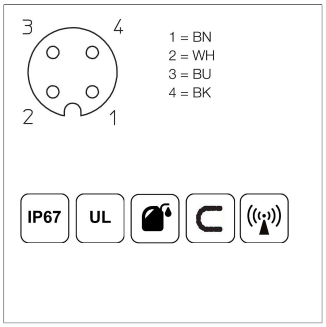
EEM-33-32/62/97

M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -25 ... +80°C (moved) -50 ... +80°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400005600	EEM-33-32	2 m
400005609	EEM-33-62	5 m
400005650	EEM-33-97	10 m





EEM-33-33/63/99

M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -25 ... +80°C (moved) -50 ... +80°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400005601	EEM-33-33	2 m
400005610	EEM-33-63	5 m
400005696	EEM-33-99	10 m

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

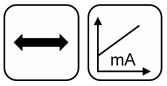
UL UL - approved

CAN CAN-Bus

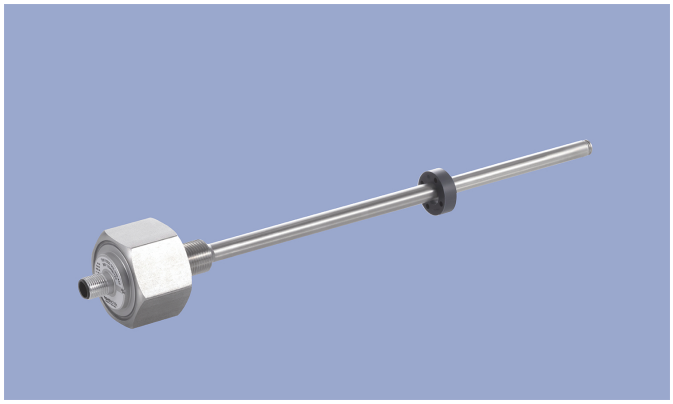
novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Screw flange
4 ... 20 mA
Industrial



CE



Special Features
- Compact design for tight spaces
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Non-contacting position detection with ring-shaped position marker
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in industrial applications
- Other configurations see separate data sheets

Applications
- Manufacturing Engineering
- Level measurement
- Actuators

The absolute linear transducer TM1 enables a compact and cost-effective position measurement. It consists of a stainless steel flange welded to a pressure-resistant rod and can therefore be used under harsh environmental conditions.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

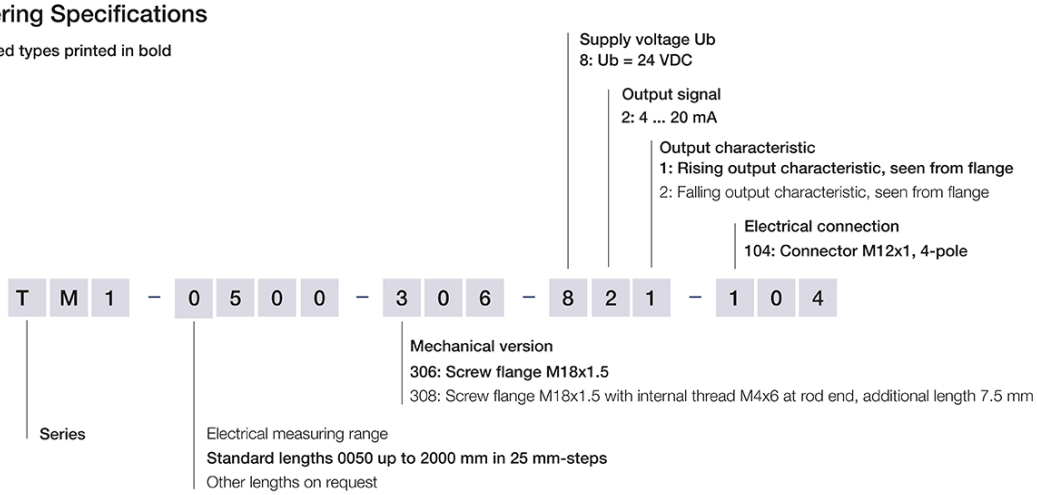
Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring NBR 90 SH A
Mounting	Screwed via thread M18x1.5
Electrical connection	Connector M12x1, A-coded

Mechanical Data	
Dimensions	See dimension drawing

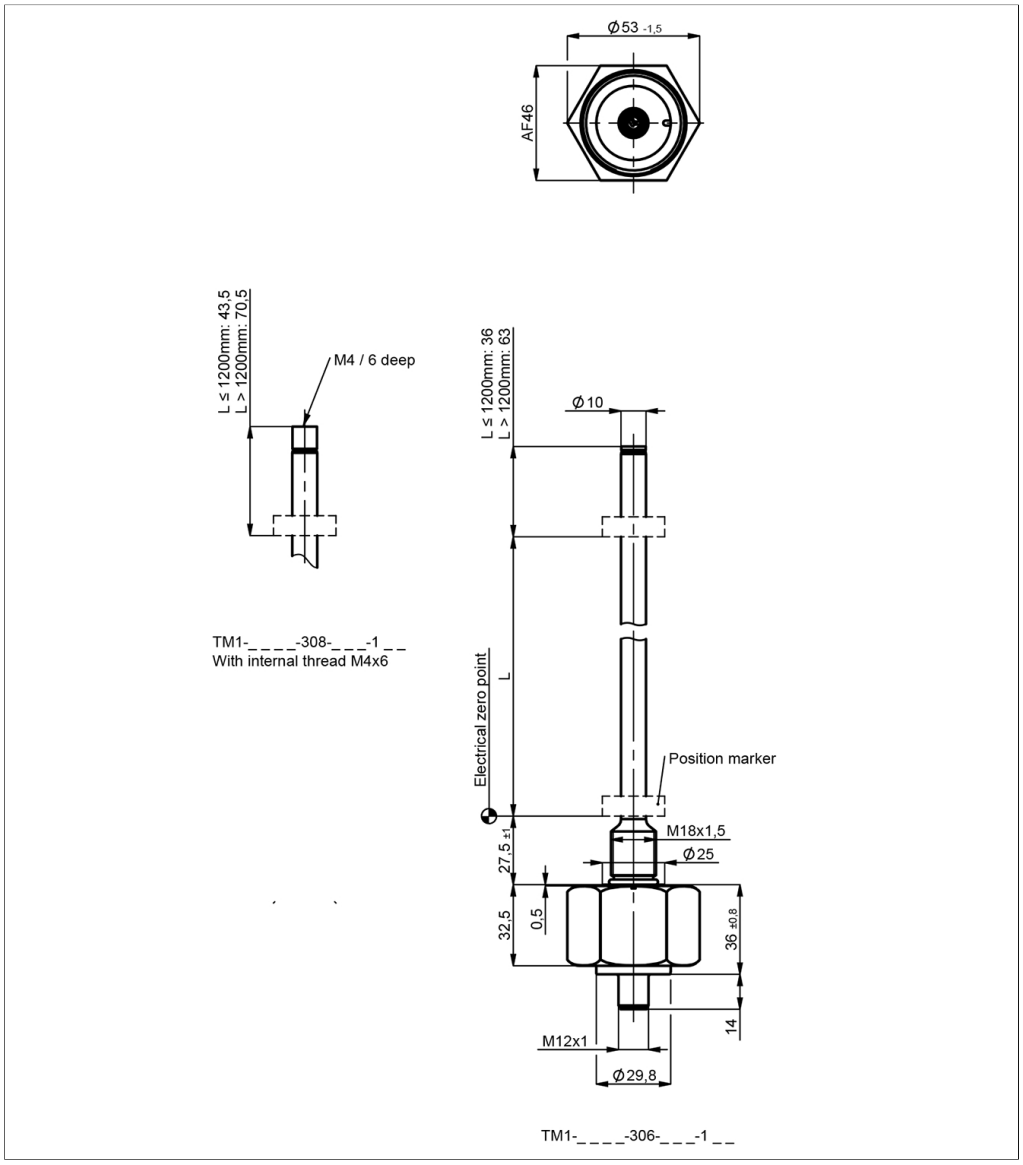
Ordering Specifications

Ordering Specifications

Preferred types printed in bold



Drawing


Ø53 -1,5
AF46
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-308-_ _ _-1 _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
L
Electrical zero point
Position marker
M18x1,5
Ø25
27,5 ±1
32,5
0,5
36 ±0,8
14
M12x1
Ø29,8
TM1-_ _ _ _-306-_ _ _-1 _ _

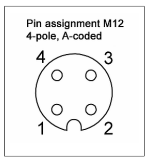
Technical Data

Type	**TM1-_ _ _ _-306-82_-104**
Output signal	4 ... 20 mA
Burden	@Ub 24 V: ≤ 500 Ω, @Ub 12 V: ≤ 250 Ω
Sampling rate / Update rate	0.5 kHz
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)
Tolerance of electr. zero point	±1 mm
Resolution	≤ 0.1 mm
Repeatability	≤ ±0.1 mm
Hysteresis	≤ ±0.1 mm
Temperature error	typ. 50 ppm/K (min. 0.01 mm/K)
Supply voltage Ub	12/24 VDC (8 ... 32 VDC)
Supply voltage ripple	≤ 10% Ub
Power drain w/o load	< 1 W
Overvoltage protection	36 VDC (permanent)
Polarity protection	yes (-36 VDC)
Short circuit protection	yes (output vs GND and supply voltage up to 36 VDC)
Insulation resistance (500 VDC)	≥ 10 MΩ
Environmental Data	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67
Operating temperature	-40 ... +105°C
Operating humidity	0 ... 95 % R.H. (no condensation)
Working pressure	≤ 350 bar
Pressure peaks	≤ 450 bar
Burst pressure	> 700 bar
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	355 years
EMC Compatibility	
EN 61000-4-2 ESD (contact/air discharge)	4 kV, 8 kV
EN 61000-4-3 Electromagnetic fields (RFI)	10 V/m
EN 61000-4-4 Fast transients (burst)	1 kV
EN 61000-4-6 Cond. disturbances (HF fields)	10 V eff.
EN 55016-2-3 Radiated disturbances	Industrial and residential area

FS = Full scale: Signal span according to electrical measuring range

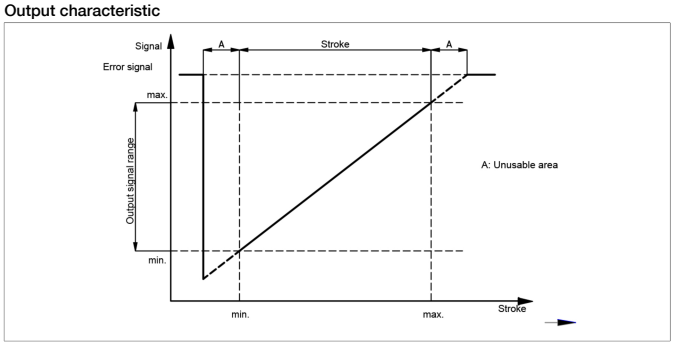
Connection Assignment

Signal	Connector code 1_ _
Supply voltage Ub	Pin 1
GND	Pin 3
Signal output	Pin 2
Do not connect	Pin 4
	Connect cable shielding to protection earth

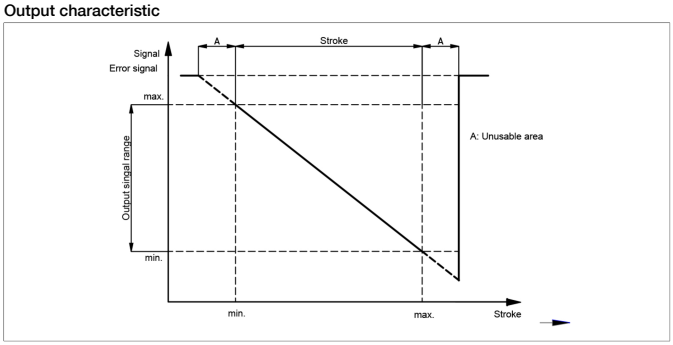


Technical Data
Output Characteristics

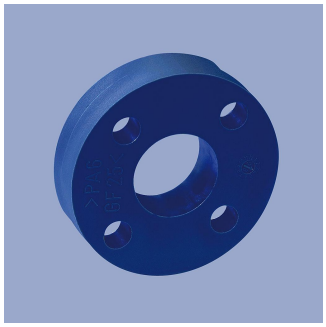
Output characteristic

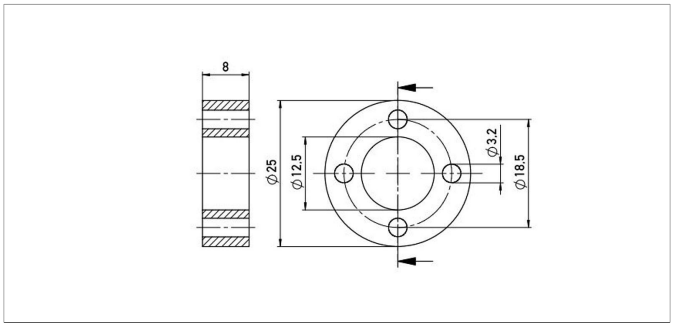


Output characteristic



Position Markers



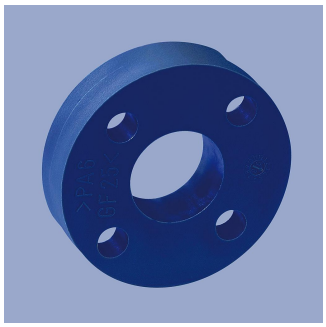


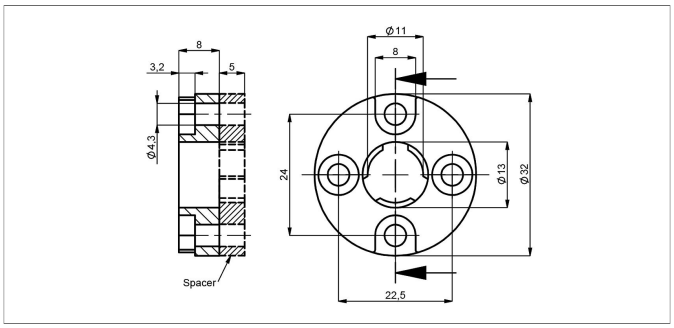
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





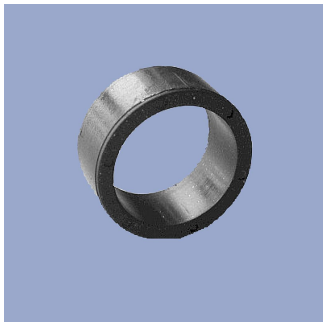
Z-TH1-P19

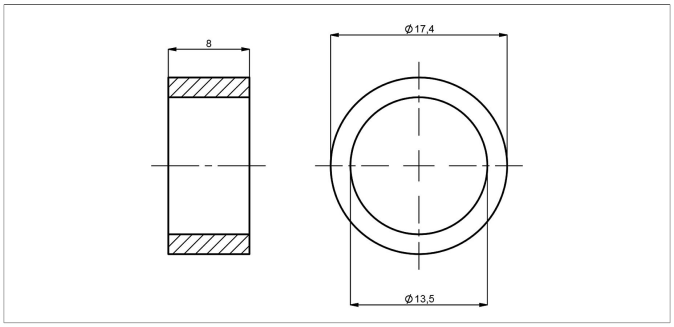
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



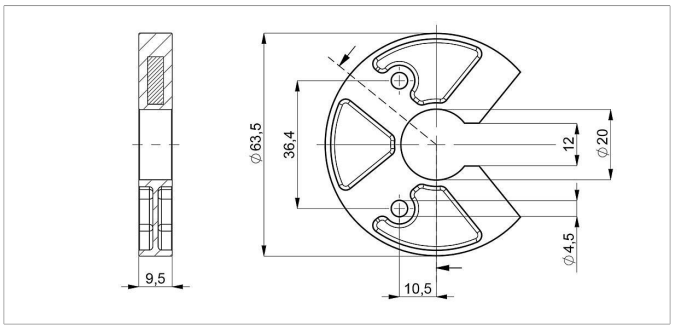


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

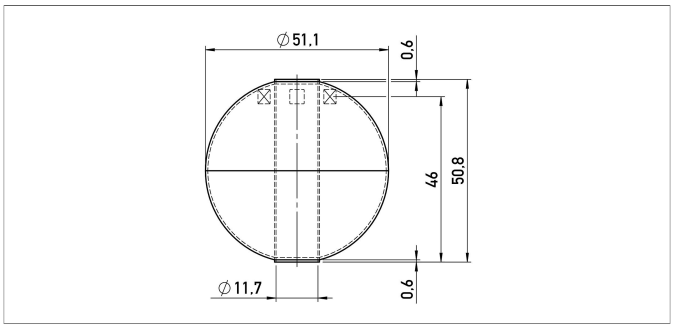
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

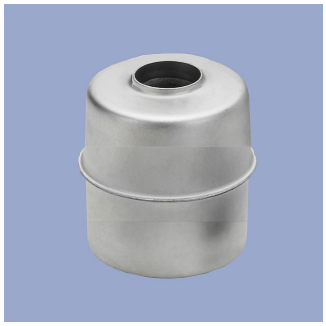
Position Markers

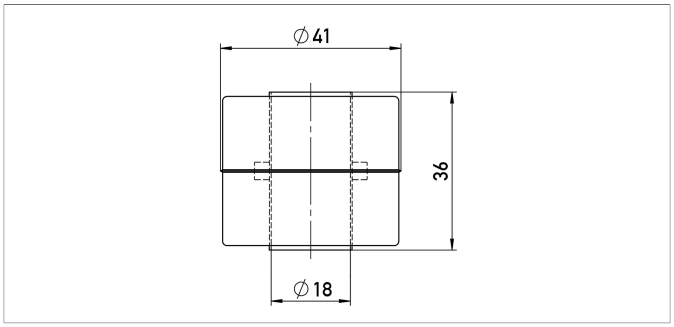


Z-TH1-P32
Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1

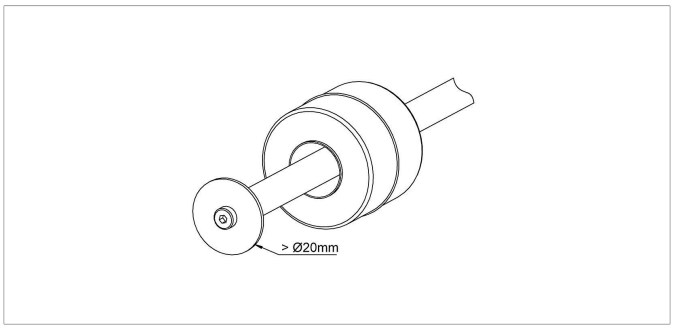




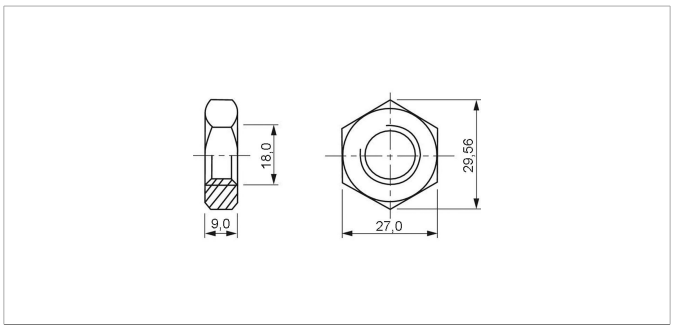
Z-TH1-P21
Cylinder floating position marker

Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

P/N	Pack. unit [pcs]
400056044	1



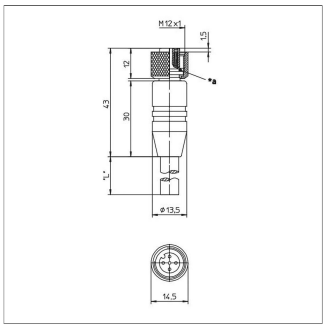
When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

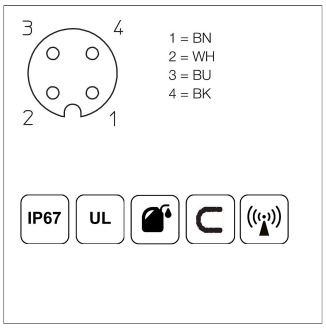


Z-TH1-M01
Lock nut ISO 8675, M18x1.5-A2

P/N	Pack. unit [pcs]
400056090	1

Connector System M12



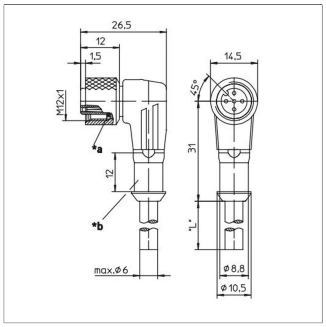


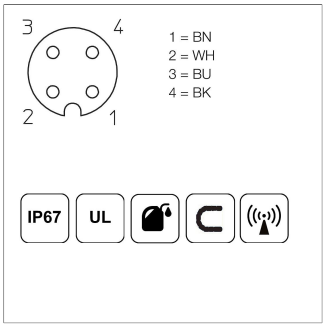
EEM-33-32/62/97

M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -25 ... +80°C (moved) -50 ... +80°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400005600	EEM-33-32	2 m
400005609	EEM-33-62	5 m
400005650	EEM-33-97	10 m





EEM-33-33/63/99

M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -25 ... +80°C (moved) -50 ... +80°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400005601	EEM-33-33	2 m
400005610	EEM-33-63	5 m
400005696	EEM-33-99	10 m

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

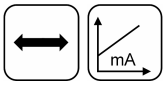
UL UL - approved

CAN CAN-Bus

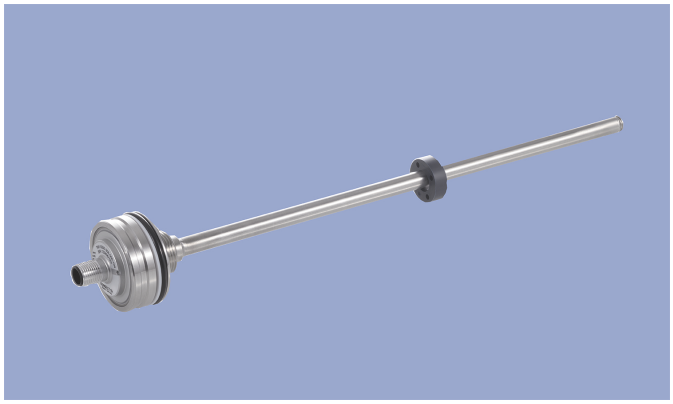
novotechnik
Siedle Group

NOVOSTRICTIVE
Transducer
Touchless

TM1
Plug-in Flange
4 ... 20 mA
Industrial



CE



Special Features
- Compact design for tight spaces
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Non-contacting position detection with ring-shaped position marker
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in industrial applications
- Other configurations see separate data sheets

Applications
- Manufacturing Engineering
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- Actuators

The absolute linear transducer TM1 enables a compact and cost-effective position measurement. It consists of a stainless steel flange welded to a pressure-resistant rod and can therefore be used under harsh environmental conditions.
The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm.
The passive ring-shaped position marker allows a mechanically decoupled measurement.

Description	
Material	Flange: stainless steel 1.4307 / AISI 304L Flange cover: AlSiMgBi Rod: stainless steel 1.4571 / AISI 316Ti Sealing: O-ring FKM 80, Supporting ring: PTFE
Mounting	Plugged and secured in position with set screw M5 ISO 4026
Electrical connection	Connector M12x1, A-coded / Connector system M12x1, A-coded with lead wires

Mechanical Data	
Dimensions	See dimension drawing

Ordering Specifications

Ordering Specifications

Preferred types printed in bold

Supply voltage Ub
8: Ub = 24 VDC

Output signal
2: 4 ... 20 mA

Output characteristic
1: Rising output characteristic, seen from flange
2: Falling output characteristic, seen from flange

Electrical connection
104: Connector M12x1, 4-pin
438: Plug system M12x1, 4-pin, with lead wires 80 mm*
442: Plug system M12x1, 4-pin, with lead wires 120 mm*
446: Plug system M12x1, 4-pin, with lead wires 160 mm*
450: Plug system M12x1, 4-pin, with lead wires 200 mm*
454: Plug system M12x1, 4-pin, with lead wires 240 mm*
* Only for installation in a cylinder

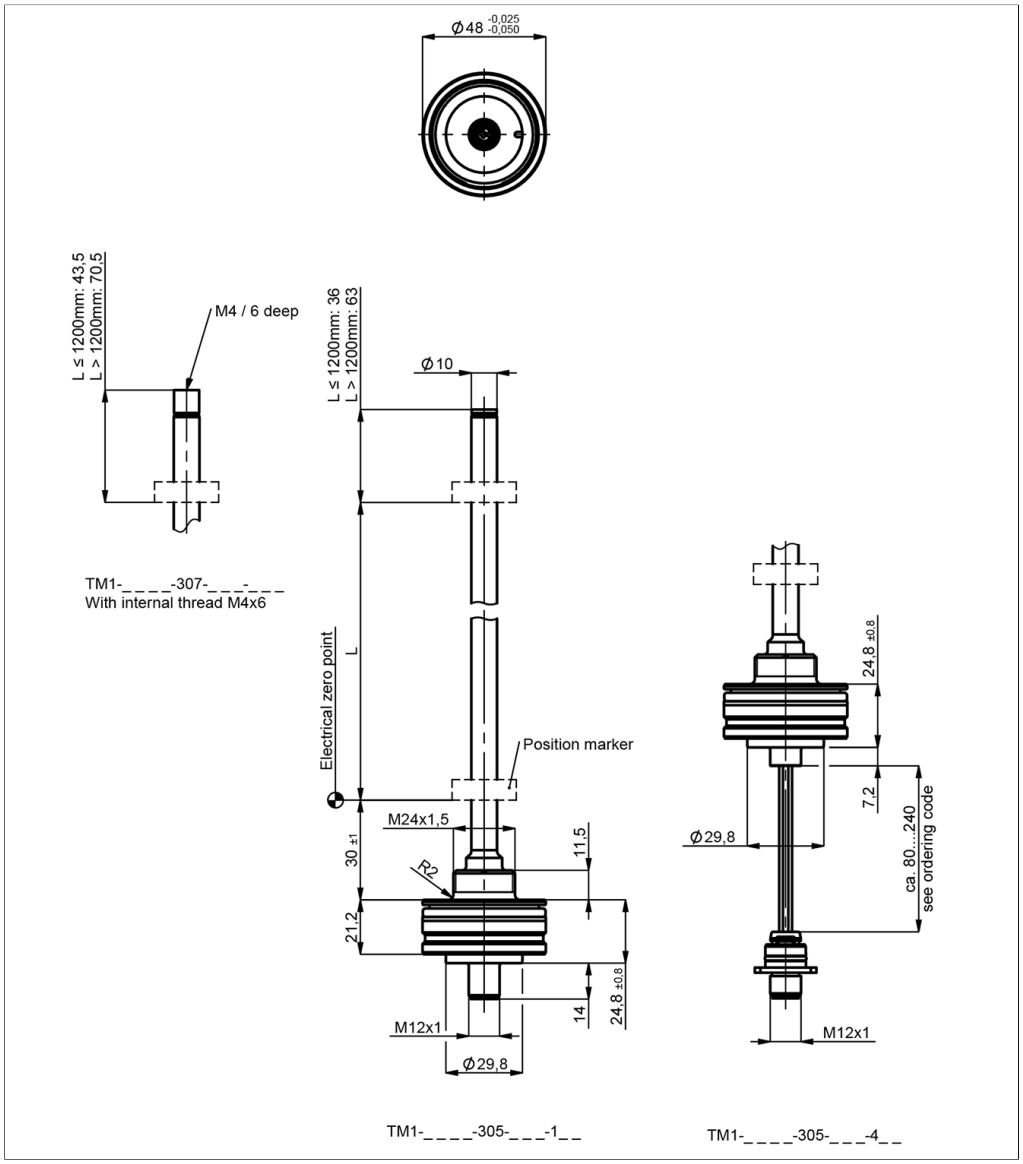
T M 1 – 0 5 0 0 – 3 0 5 – 8 2 1 – 1 0 4

Mechanical version
305: Plug-in flange Ø 48 mm
307: Plug-in flange Ø 48 mm with internal thread M4x6 at rod end, additional length 7.5 mm

Series

Electrical measuring range
Standard lengths 0050 up to 2000 mm in 25 mm-steps
Other lengths on request

Drawing


Ø48 -0,025 -0,050
L ≤ 1200mm: 43,5
L > 1200mm: 70,5
M4 / 6 deep
TM1-_ _ _ _-307-_ _ _-_ _ _
With internal thread M4x6
L ≤ 1200mm: 36
L > 1200mm: 63
Ø10
Electrical zero point
L
Position marker
M24x1,5
30 ±1
R2
11,5
21,2
14
24,8 ±0,8
M12x1
Ø29,8
TM1-_ _ _ _-305-_ _ _-1_ _
24,8 ±0,8
7,2
Ø29,8
ca. 80...240
see ordering code
M12x1
TM1-_ _ _ _-305-_ _ _-4_ _

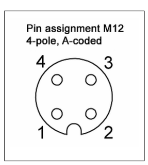
Technical Data

Type	**TM1-_ _ _ _-305-82_-_ _ _**
Output signal	4 ... 20 mA
Burden	@Ub 24 V: ≤ 500 Ω, @Ub 12 V: ≤ 250 Ω
Sampling rate / Update rate	0.5 kHz
Electrical measuring range (dim. L)	0 ... 50 mm up to 0 ... 2000 mm
Absolute linearity	≤ ±0.04 %FS (min. 300 µm)
Tolerance of electr. zero point	±1 mm
Resolution	≤ 0.1 mm
Repeatability	≤ ±0.1 mm
Hysteresis	≤ ±0.1 mm
Temperature error	typ. 50 ppm/K (min. 0.01 mm/K)
Supply voltage Ub	12/24 VDC (8 ... 32 VDC)
Supply voltage ripple	≤ 10% Ub
Power drain w/o load	< 1 W
Overvoltage protection	36 VDC (permanent)
Polarity protection	yes (-36 VDC)
Short circuit protection	yes (output vs GND and supply voltage up to 36 VDC)
Insulation resistance (500 VDC)	≥ 10 MΩ
Environmental Data	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67 (Connector system M12, fastened, when correctly fitted in cylinder: IP69)
Operating temperature	-40 ... +105°C, -40 ... +85°C (connector system M12)
Operating humidity	0 ... 95 % R.H. (no condensation)
Working pressure	≤ 350 bar
Pressure peaks	≤ 450 bar
Burst pressure	> 700 bar
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	355 years
EMC Compatibility	
EN 61000-4-2 ESD (contact/air discharge)	4 kV, 8 kV
EN 61000-4-3 Electromagnetic fields (RFI)	10 V/m
EN 61000-4-4 Fast transients (burst)	1 kV
EN 61000-4-6 Cond. disturbances (HF fields)	10 V eff.
EN 55016-2-3 Radiated disturbances	Industrial and residential area
	Only for connector system M12: Data applies only inside a cylinder.
	The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.

FS = Full scale: Signal span according to electrical measuring range

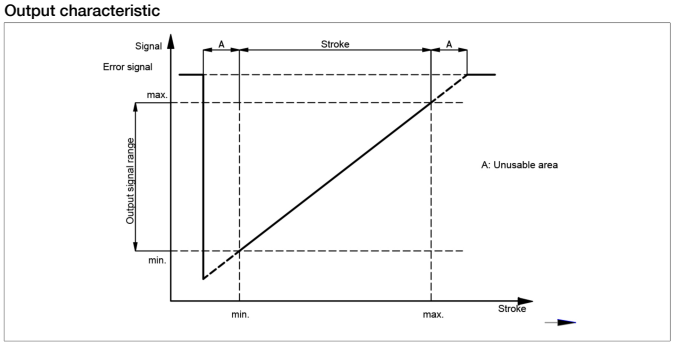
Connection Assignment

Signal	Connector code 1_ _	Plug system code 4_ _
Supply voltage Ub	Pin 1	Pin 1
GND	Pin 3	Pin 3
Signal output	Pin 2	Pin 2
Do not connect	Pin 4	Pin 4
	Connect cable shielding to protection earth	

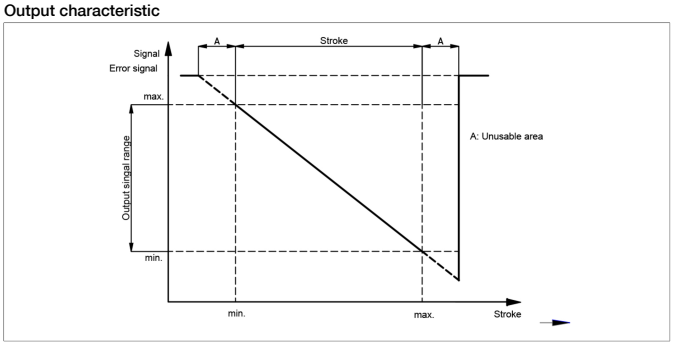


Technical Data
Output Characteristics

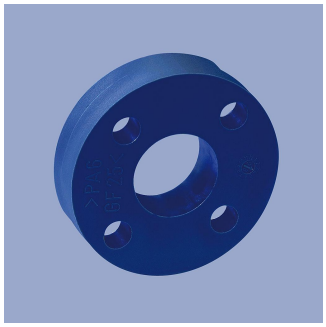
Output characteristic

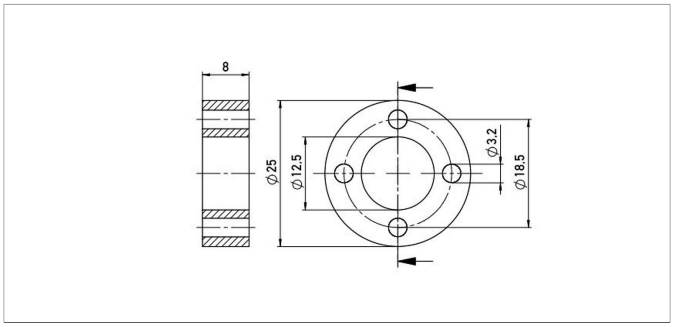


Output characteristic



Position Markers



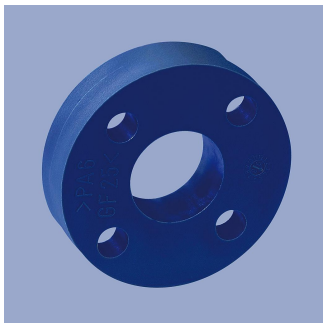


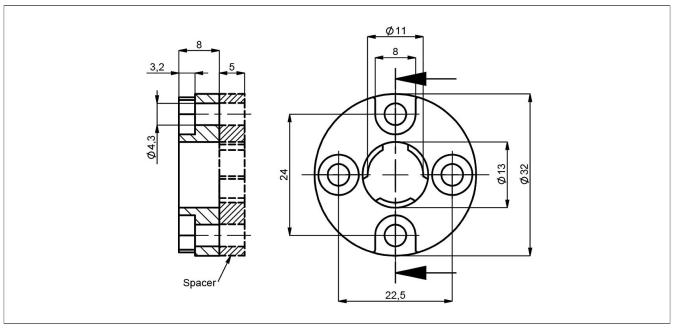
Z-TH1-P18

Ring position marker for fixation with screws M3

Material	PA6-GF
Weight	approx. 12 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400005697	1





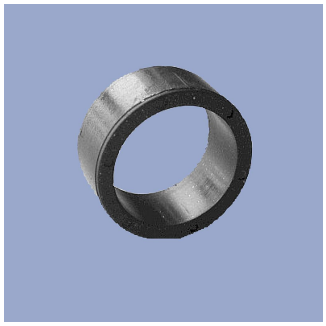
Z-TH1-P19

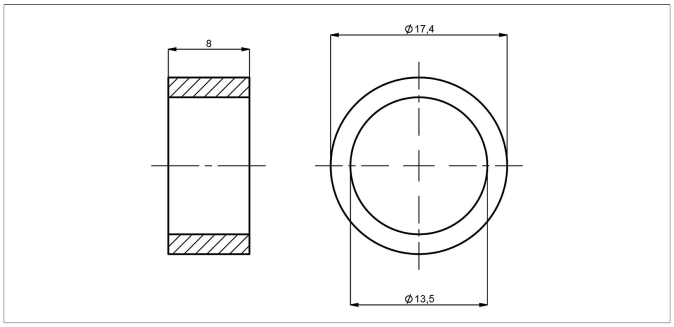
Z-TH1-PD19 With spacer

Ring position marker for fixation with screws M4, optionally with or without spacer

Material	PA6-GF, Spacer: POM-GF
Weight	approx. 14 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 40 N/mm²
Fastening torque	max. 100 Ncm

P/N	Spacer	Pack. unit [pcs]
400005698	-	1
400107117	incl.	1



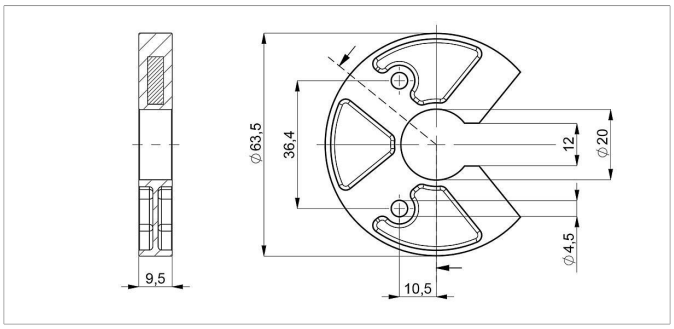


Z-TH1-P30

Ring position marker for mounting via lock washer and retaining ring

Material	NdFeB bonded (EP)
Weight	approx. 5 g
Operating temp.	-40 ... +100°C
Surface pressure	max. 10 N/mm²

P/N	Pack. unit [pcs]
400106139	1



Z-TH1-P25

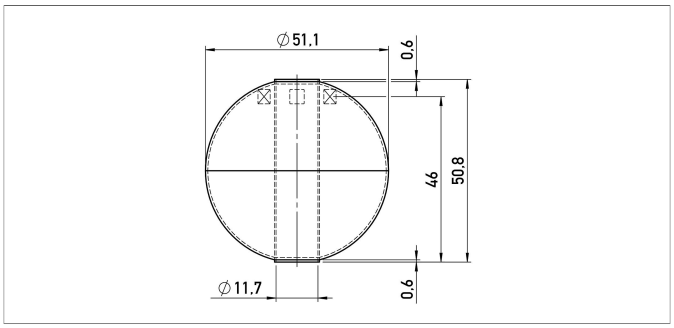
U-shaped position marker for fixation with M4 screws

Caution: for dimension of electrical zero point please follow the user manual!

Material	PA6-GF
Operating temp.	-40 ... +105°C
Surface pressure	max. 40 N/mm²
Fastening torque of mounting	max. 100 Ncm

P/N	Pack. unit [pcs]
400105076	1

Position Markers

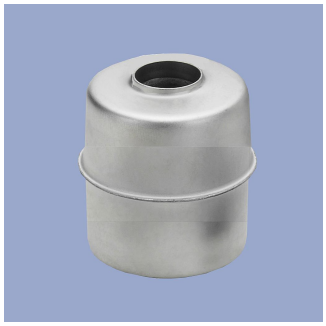


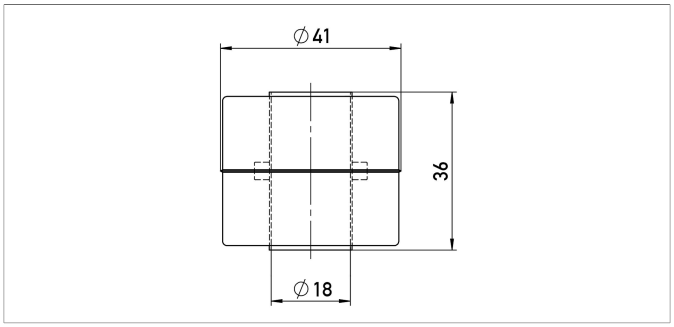
Z-TH1-P32

Ball-type floating position marker

Material	Stainless steel 1.4571
Weight	approx. 42 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 40 bar
Density	720 kg/m³
Immersion depth in water	36.7 mm

P/N	Pack. unit [pcs]
400105703	1



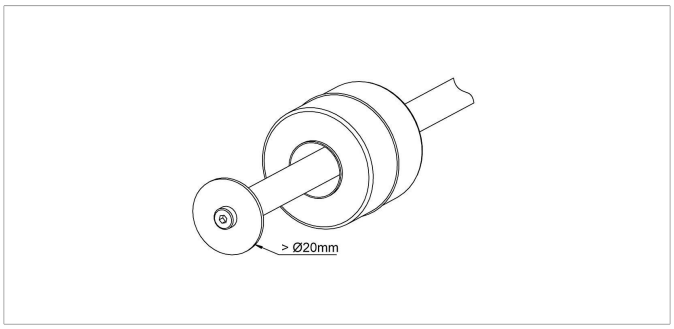


Z-TH1-P21

Cylinder floating position marker

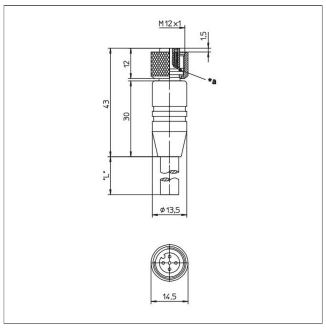
Material	Stainless steel 1.4404
Weight	approx. 20 g
Operating temp.	-40 ... +100°C
Compression strength	≤ 8 bar
Density	740 kg/m³
Immersion depth in water	approx. 26.6 mm

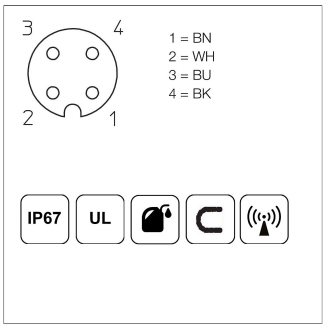
P/N	Pack. unit [pcs]
400056044	1



When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

Connector System M12



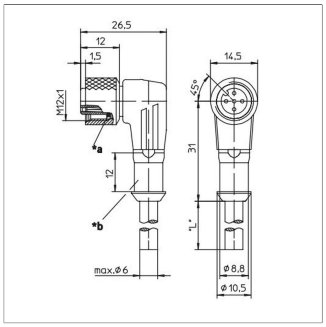


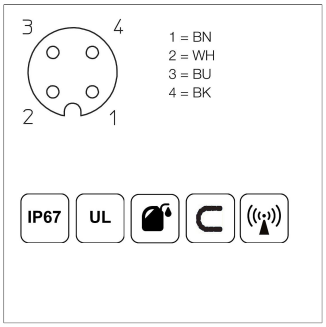
EEM-33-32/62/97

M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -25 ... +80°C (moved) -50 ... +80°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400005600	EEM-33-32	2 m
400005609	EEM-33-62	5 m
400005650	EEM-33-97	10 m





EEM-33-33/63/99

M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, shielded, IP67, open ended

Plug housing	PA
Cable sheath	PUR, Ø = max. 6 mm, -25 ... +80°C (moved) -50 ... +80°C (fixed)
Lead wires	PP, 0.34 mm²

P/N	Type	Length
400005601	EEM-33-33	2 m
400005610	EEM-33-63	5 m
400005696	EEM-33-99	10 m

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

UL UL - approved

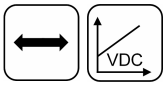
CAN CAN-Bus

novotechnik
Siedle Group

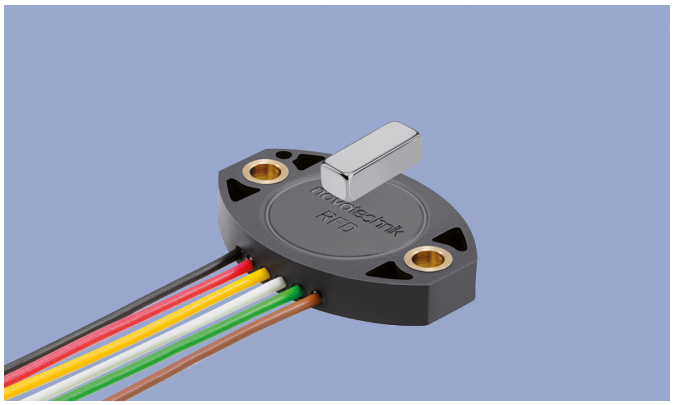
Project item
Please contact your local distributor

NOVOHALL Short Stroke Transducer 5 up to 50 mm Touchless

TFD-4000
Ratiometric



CE



Special Features
- Touchless hall technology
- 2 part design, mechanically decoupled
- High protection class, IP67, IP68, IP69
- Resolution up to 12 bit
- Wear-free
- Temperature range -40 °C up to +125 °C
- One and multi-channel versions
- Optimized for mechanical engineering and mobile applications
- Competitive price / performance ratio
- Extremely flat design
- Customized versions available on request

Applications
- Manufacturing Engineering (textile machinery, packaging machinery, sheet metal and wire machinery)
- Medical Engineering
- Mobile working machines (industrial trucks, construction machinery, agricultural and forestry machinery)
- Marine applications

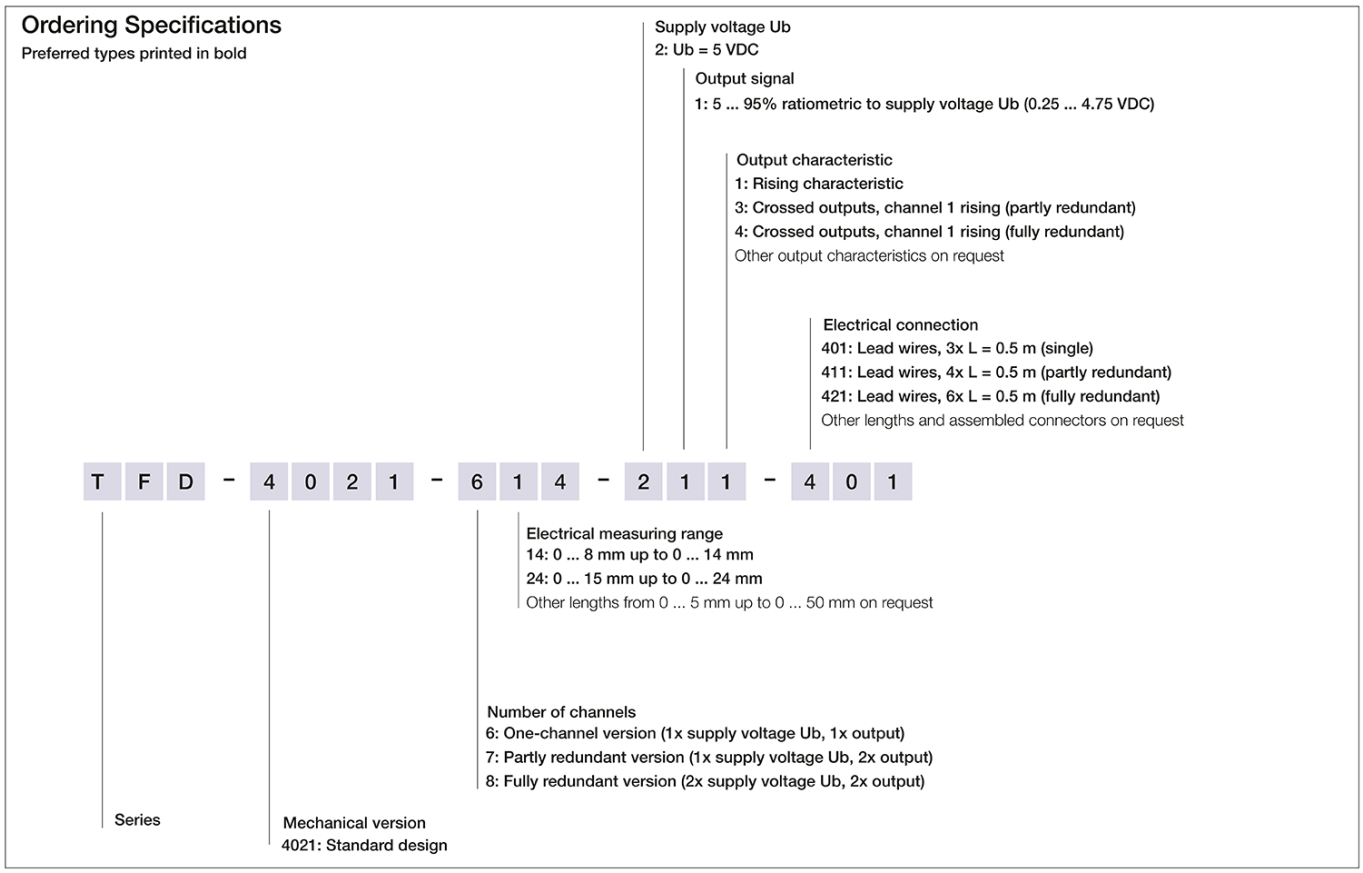
The sensor utilizes a contactless magnetic technology to determine the measured position. A separate magnet or magnetic position marker is attached to the moving element to be measured. The orientation of the magnetic field is measured and an analog voltage representing the stroke is the output signal. The touchless position sensor TFD-4000 is ideally suited for positioning in measuring ranges from 0… 5 to 0… 50 mm.
The very compact physical dimensions allow installation in small spaces. The housing is made of high grade temperature-resistant plastic material. The sensor is sealed and is not sensitive to dust, dirt or moisture.
The 2 part design, with the TFD sensor itself and its magnetic position marker, offers great flexibility when mounting.

The accuracy of linear magnetic sensors is strongly influenced by the installation space. Our many years of experience in development, production and application of magnetic sensors as well as our state-of-the-art simulation tools allow us to provide you with optimal designs to suit your applications.

Description	
Material	Housing: high grade, temperature resistant plastic PBT GF with brass inserts
Mounting	With 2 pan head screws M4x14 (included in delivery)
Fastening torque of mounting	250 ± 50 Ncm
Electrical connection	Lead wires 0.5 mm² (AWG 20), PVC

Mechanical Data	
Dimensions	See dimension drawing
Weight (w/o connection)	approx. 10 g

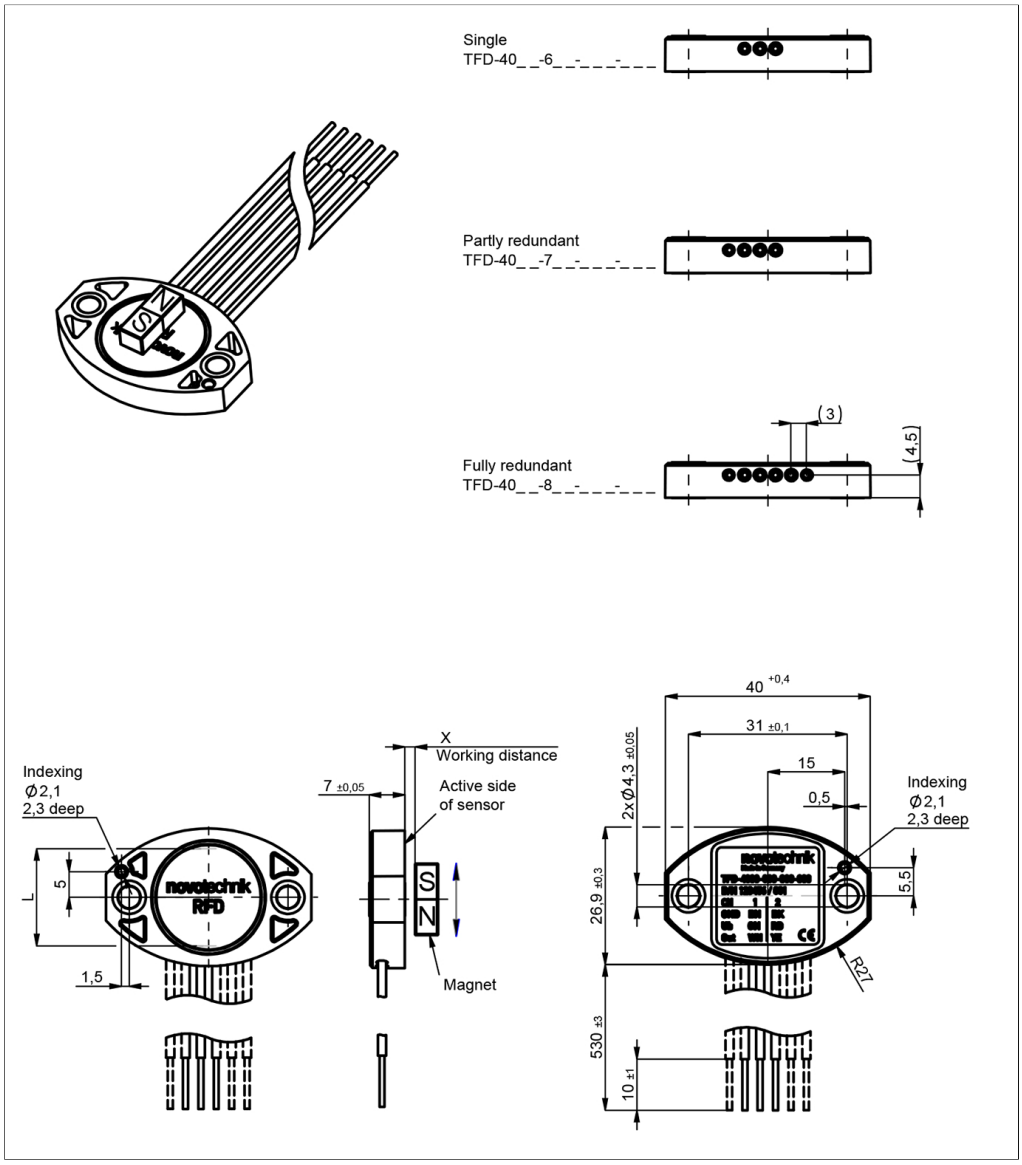
Ordering Specifications

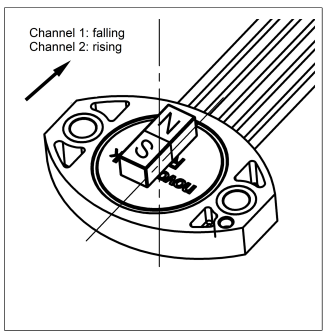


Accessories included in delivery

- 2x Pan head screws M4x14

Drawing





If the magnet is located centrally to the sensor, the sensor is near the electrical center position.
Direction of output characteristic with north pole alignment (color marking) or marking according to sketch:
Signal channel 1 falling, signal channel 2 rising when moving in direction of the electrical connection.

Technical Data

Type	**TFD-4021-_14-2_ _-_ _ _** **Max. Measuring Range 14 mm**	**TFD-4021-_24-2_ _-_ _ _** **Max. Measuring Range 24 mm**
Output signal	ratiometric to supply voltage Ub 5 ... 95% (0.25 ... 4.75 V) in electrical measuring range (dim. L)	
Load	≥ 10 kΩ	
Number of channels	1 / 2	
Update rate	typ. 2.5 kHz	
Electrical measuring range (dim. L)	0 ... 8 mm up to 0 ... 14 mm	0 ... 15 mm up to 0 ... 24 mm
Resolution	12 bits	
Repeatability	≤ ±0.1 %FS	
Hysteresis	≤ ±0.1 %FS	
Temperature error	±0.5 %FS	
Supply voltage Ub	5 VDC (4.5 ... 5.5 VDC)	
Current consumption w/o load	typ. 15 mA (typ. 8 mA on request)	
Polarity protection	yes (supply lines)	
Short circuit protection	yes (all outputs vs. GND and supply voltage)	
Insulation resistance (500 VDC)	≥ 10 MΩ	
Environmental Data		
Max. operational speed	Mechanically unlimited	
Vibration IEC 60068-2-6	20 g, 5 ... 2000 Hz, Amax = 0.75 mm	
Shock IEC 60068-2-27	50 g, 6 ms	
Protection class DIN EN 60529	IP67 / IP68 / IP69	
Operating temperature	-40 ... +125°C	
Life	Mechanically unlimited	
Functional safety	The sensor is not suitable for use in safety-related applications.	
MTTF (IEC 60050)	9926 years (one-channel), 4441 years (partly redundant, per channel) or 4512 years (fully redundant, per channel)	
EMC Compatibility		
ISO 10605 ESD (Handling/Component)	8 kV / 15 kV	
ISO 11452-2 Radiated HF-fields	200 V/m	
ISO 11452-5 Radiated HF-Fields, stripline	200 V/m	
CISPR 25 Radiated emission	Level 5	
EN 61000-4-4 Fast transients (burst)	1 kV	
EN 61000-4-6 Cond. disturbances (HF fields)	10 V eff.	
EN 61000-4-8 Magnetic fields	30 A/m	

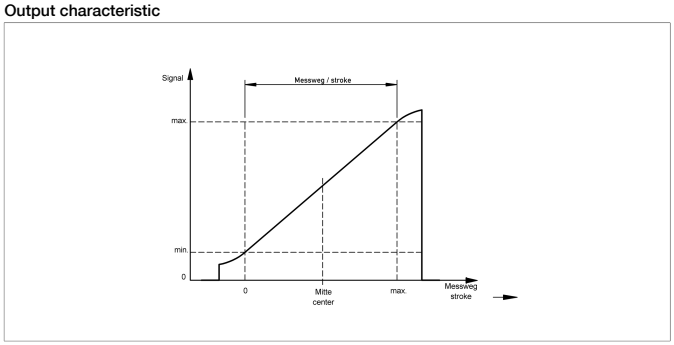
FS = Full scale: Signal span according to electrical measuring range
Available on request: SPI or PWM interface

Connection Assignment

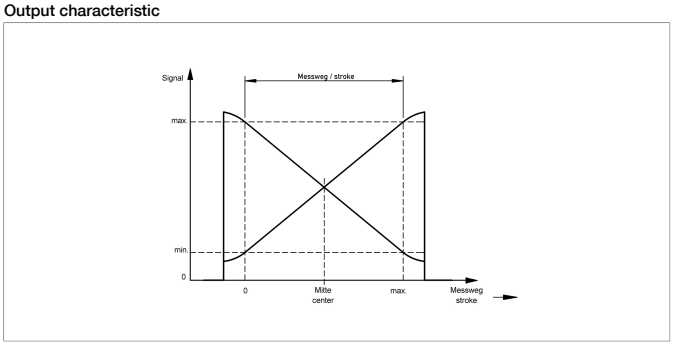
Signal	Lead wires code 40_	Lead wires code 41_	Lead wires code 42_
	One-channel	Partly redundant	Fully redundant
Supply voltage Ub	GN	GN	GN
GND	BN	BN	BN
Signal output	WH	WH	WH
Signal output 2	-	YE	YE
Supply voltage Ub 2	-	-	RD
GND 2	-	-	BK

Technical Data
Output
Characteristics

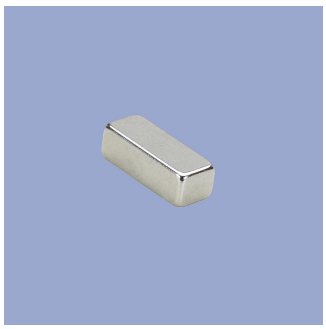
Output characteristic

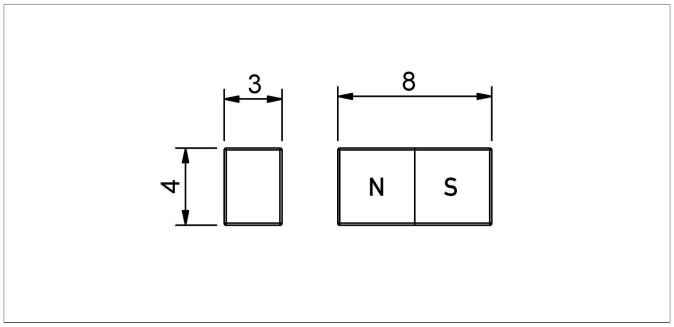


Output characteristic



Position Markers

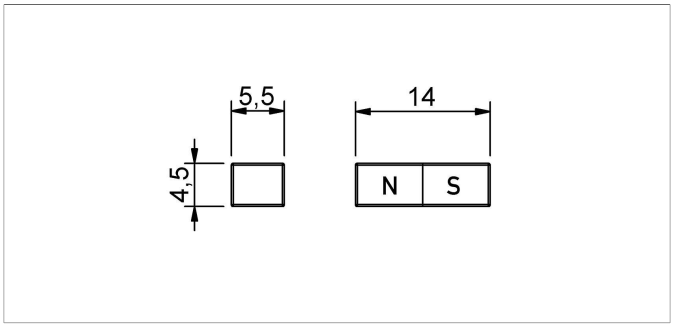




Z-TFC-P03
Magnet for direct application onto customer's shaft (see user manual).
We recommend mounting on non-magnetizable materials, otherwise the specified working distances will vary (e.g. reduction of approx. 20% with axial mounting on a magnetizable shaft).

Measuring range	0 ... 8 mm up to 0 ... 14 mm
Working distance	One-channel 0.7 ± 0.5 mm, redundant 0.3 +0.5/-0.3 mm
Permitted lateral offset	±1 mm
Operating temp.	-40 ... +125°C

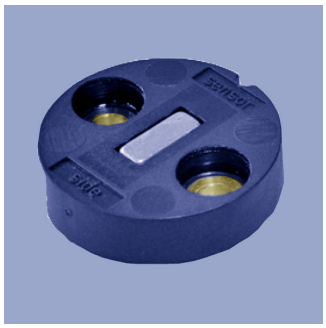
P/N	Pack. unit [pcs]
400104225	1

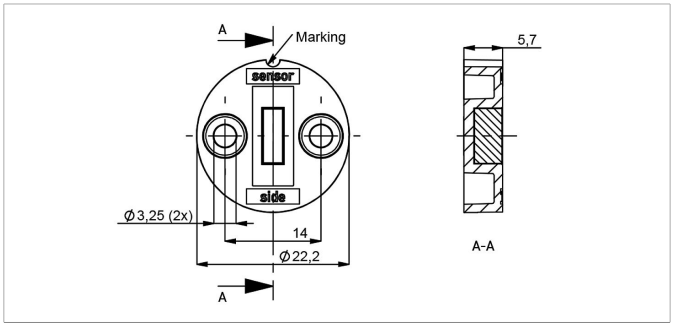


Z-TFC-P04
Magnet for direct application onto customer's shaft (see user manual).
We recommend mounting on non-magnetizable materials, otherwise the specified working distances will vary (e.g. reduction of approx. 20% with axial mounting on a magnetizable shaft).

Measuring range	0 ... 15 mm up to 0 ... 24 mm
Working distance	One-channel 2.5 ± 0.9 mm, redundant 2 ± 0.9 mm
Permitted lateral offset	±1 mm
Operating temp.	-40 ... +125°C

P/N	Pack. unit [pcs]
400104226	1

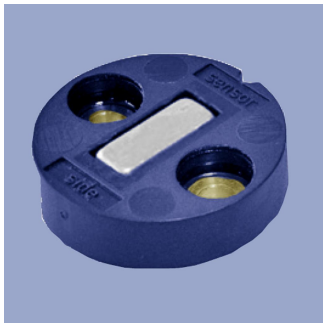


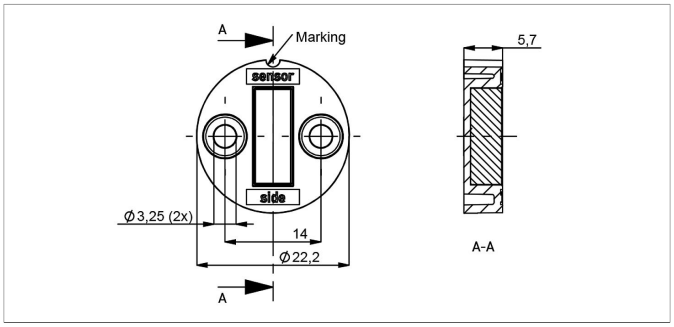


Z-TFC-P30
Position marker for frontal fixation with 2 cylinder screws M3x8 (included in delivery).

Measuring range	0 ... 8 mm up to 0 ... 14 mm
Working distance	One-channel 0.7 ± 0.5 mm, redundant 0.3 +0.5/-0.3 mm
Permitted lateral offset	±1 mm
Material	PBT-GF
Operating temp.	-40 ... +125°C

P/N	Pack. unit [pcs]
400106758	1
400106757	25



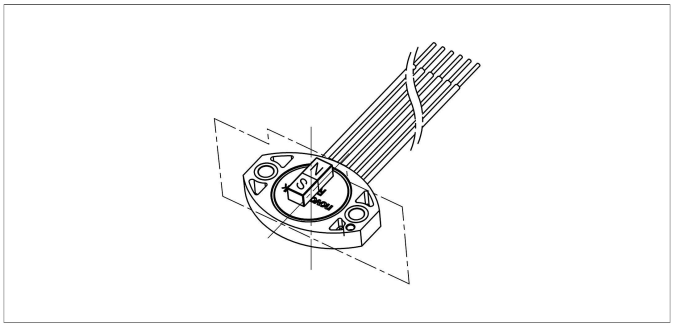


Z-TFC-P31
Position marker for frontal fixation with 2 cylinder screws M3x8 (included in delivery).

Measuring range	0 ... 15 mm up to 0 ... 24 mm
Working distance	One-channel 2.5 ± 0.9 mm, redundant 2 ± 0.9 mm
Permitted lateral offset	±1 mm
Material	PBT-GF
Operating temp.	-40 ... +125°C

P/N	Pack. unit [pcs]
400106760	1
400106759	25

Position Markers



Installation Instruction

The accuracy of linear magnetic sensors is strongly influenced by the installation space. Using the latest simulation tools, we are able to design the measurement system optimally for yourapplication. In order to select the best suitable magnet for your requirements please contact us. Between magnet / sensor unit and surrounding magnetic or magnetizable materials a minimum distance of 12 mm must be ensured. If this is not possible, the accuracy of the system will be affected and the data have to be verified.

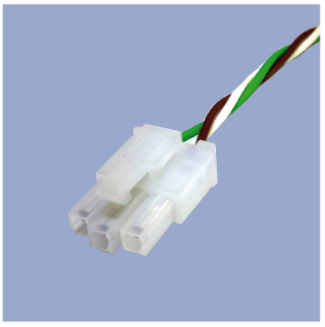
Connecting Options on request

M12 connector
- Customized lengths
- 3-, 4-, 6- and 8-pole versions
- Protection class IP68
- Ordering codes of standard versions see ordering specifications

Tyco AMP Super Seal
- Pin- and bushing housing
- Customized lengths
- 3-, 4- and 6-pole versions
- Protection class IP67
- On request

Deutsch DTM 04
- Pin- and bushing housing
- Customized lengths
- 3-, 4- and 6-pole versions
- Protection class IP67
- On request

ITT Cannon Sure Seal connector
- Customized lengths
- 3-, 4- and 6-pole versions
- Protection class IP67
- On request



Molex Mini Fit jr.
- Customized length and lead wires
- 3-, 4- and 6-pole versions
- On request

Molex Mini Fit jr.
- Customized length and lead wires
- 3-, 4- and 6-pole versions
- On request

novotechnik
Siedle Group

Position Transducers Linotast, induktive

Series F 200 g

Special features

- very good linearity, Standard ±0,1 ... ±0,3 %
- with connetor, protection class IP 67 (only with EEM 33-70)
- reverse voltage protection
- bult-in hybrid electronic circuitry
- DC power supply, DC output
- almost infinite resolution
- good temperature constancy

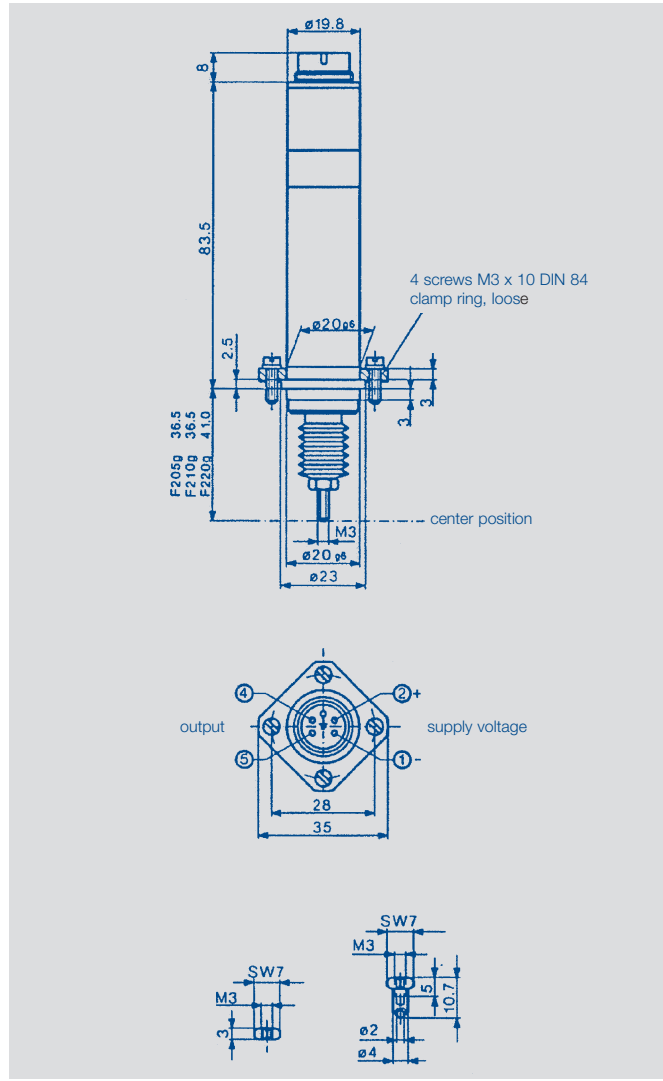
The inductive position transducer series F 200 converts small rectilinear displacements into electrical analogue signals by means of a differential transformer with a movable core.

The core is mounted on a pushrod wich may be pressed by a built-in spring against the object to be measured, or rigidly connected to the object.

The transducer is supplied with a DC voltage. A built-in oscillator provides an AC voltage to supply the diffential transfomer.

The secondary voltages of the transformer are rectified by a demodulator which is also built-in. The oscillator and the demodulator are hybrid circuits.

The DC output voltage is strictly proportional to the displacement of the core and, therefore, to the displacement to be measured. The electrical zero is in the middle of the useful stroke of the pushrod.



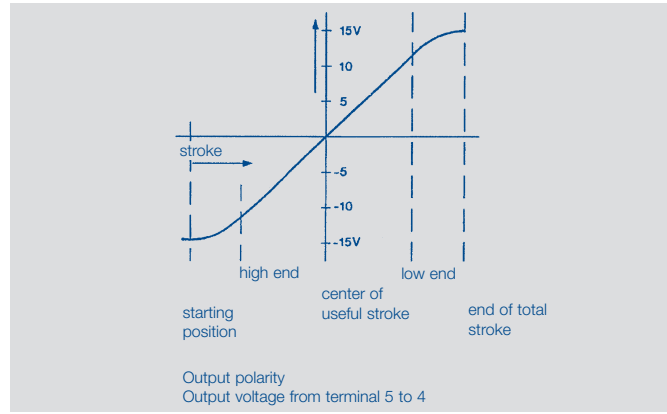
Description	
Housing	black anodized aluminium
Actuating rod	antimagnetic stainless steel; a pre-stressed helical spring presses the pushrod outwords against the stop
Bearing	maintenance-free plasstic sleeves, pushrod passage dust-proofed by bellows
Fixing	centering pilot, collar and clamp flange
Electrical connections	5-pin connector (see accessoreis) protection class depending on connector type
Electronic	potted hybrid circuits

Type	F205g	F205.1g	F210g	F210.1g	F220g	
Mechanical Data						
Operating force	≤ 2					N
Mass of actuating rod	6	6	6	6	7	g
Total weight	80					g
Dimensions	see drawing					
Electrical Data						
Independent linearity	0,2	0,1	0,2	0,1	0,3	±%
Defined electrical range	5 (±2,5)	5 (±2,5)	10 (±5)	10 (±5)	20 (±10)	mm mm
Mechanical range	8	8	12	12	22	mm
Sensitivity approx. (supply 24 VDC)	4,5	4,5	2,2	2,2	1	V/mm
Power supply	24 ±20 %					VDC
Reverse voltage protection	parallel-connected diode; max. permitted curent with inverse voltage; 1 A (or 50 A for 8 ms)					
Current consumption	approx. 50					mA
Output voltage	±10, floating DC voltage					VDC
Residual ripple	1 % of DC output voltage, or 10 mV pk-pk, whichever is greater					
Internal resistance (dynamic) (Output circuit is short-circuit proof)	4					kΩ
Zero drift for variation of supply voltage	< 1 µm/10 %					
Thermal zero shift	< 1 µm/10 K					
Thermal sensitivity shift	25 typ.					ppm/K
Sensitivity change	proportional to supply voltage					
Maximum permitted voltage between output terminals and housing plus between input and output	100					VDC

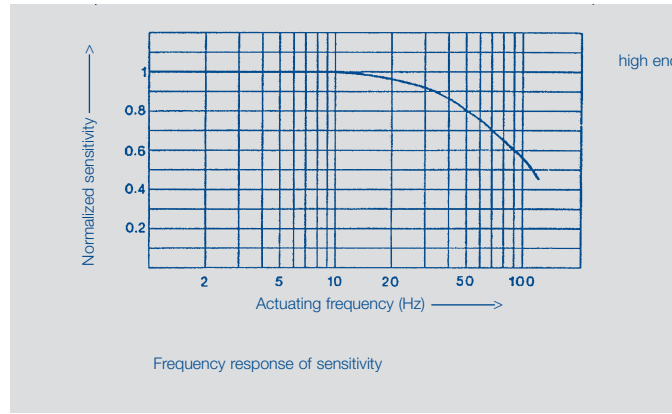
Environmental Data	
Temperature	-30 ... +70 °C
Acceleration	10 g in all directions
Humidity	Transducer is insensitive against humidity, water wetting, grinding oil and coolant

Order designations

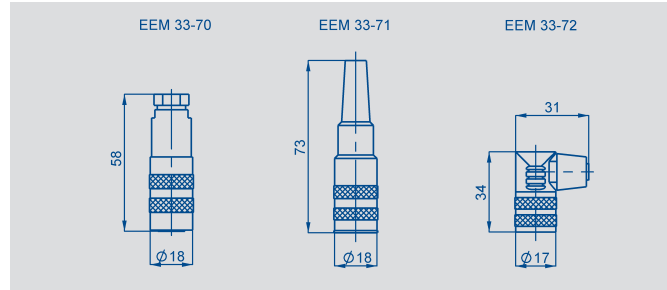
Type	Art.-No.
F 205 g	005303
F 205.1 g	005304
F 210 g	005323
F 210.1 g	005324
F 220 g	005325



Output polarity
Output voltage from terminal 5 to 4



Frequency response of sensitivity



Included in delivery
Screw-on probe with hard-alloy ball-point and stainless steel locknut. Allows friction-locked connection between gauging pin and measuring object.
Connecting ring with unlose-able screws.

Recommended accessories
Connector EEM 30-70
protection class IP 67,
Art.Nr. 005611,
Connector EEM 33-71
protection class IP 40
Art.Nr. 005612,
Angled connector EEM 33-72
protection class IP 40
Art.Nr. 005613

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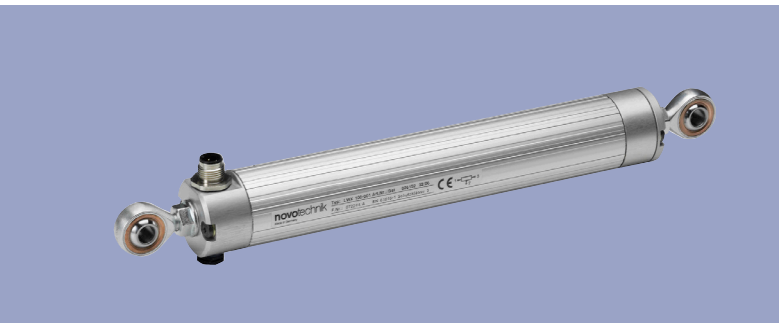
Transducer
Pivot head mounting potentiometric up to 750 mm, IP67

Series LWX
Model 003



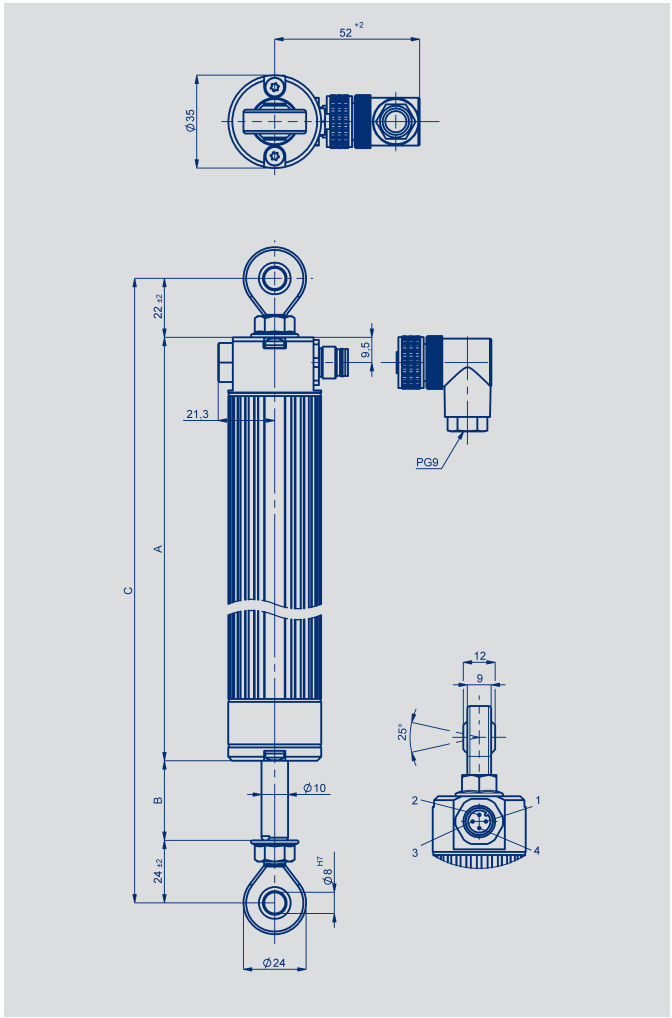
Designed for extreme operating environments, the LWX series features an all-metal construction and a pressure compensation technology to prevent buildup that could degrade operation in mechanical, vehicle, automation and robotic applications where an extended operating life is essential.

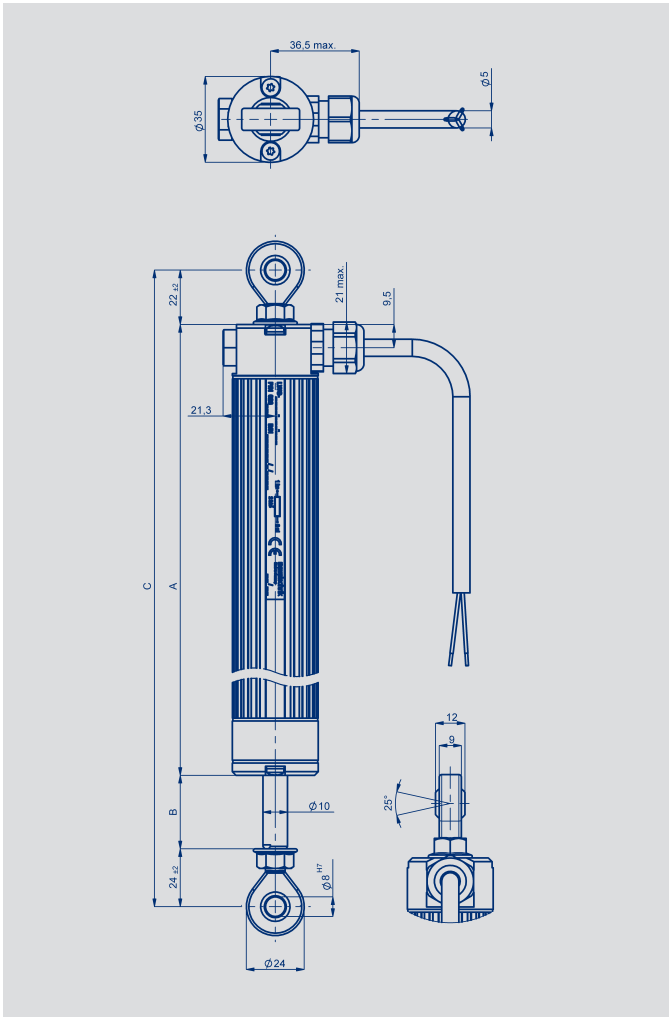
These rugged position transducers provide direct, absolute measurement of displacement or length.
A free-pivot-head mounted on the actuating rod eliminates backlash guaranteeing high accuracy.

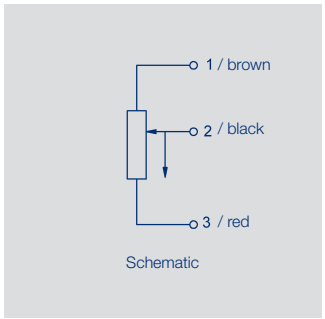
Special features
- protection class IP67
- all-metal housing
- corrosion resistant
- differential pressure compensation system with GORE membrane - compensates for pump effect of push rod movement
- high vibration resistance
- suitable for harsh environmental conditions (humidity, oil, dust)
- double beared actuating rod
- mountable via low-backlash pivot heads with a large angle of free movement (up ±12.5 °)
- outstanding linearity up to ±0.04 %
- resolution better than 0.01 mm
- long life up to 50 million movements, depending on application
- cable or connector version available
- version IP65 see data sheet LWG
- shaft protected version see data sheet LWX, model 004

Applications
- steering cylinders in mobile machines
- building equipment
- machines in the media-polluted environment (e.g. production of concrete fabricated components)

Description	
Housing	aluminium, anodized
Mounting	Pivot Head Mounting (Stainless steel pivot heads on request)
Actuating rod	stainless steel (1.4305), rotable
Bearings	metal-polymer slide bearing
Resistane element	conductive plastic
Wiper assembly	precious metal multi-finger wiper, elastomer damped
Electrical connections	4-pin round connector, M12x1 or 3-wire PVC-cable, 3x0.5 mm² (AWG 20), shielded, 1 m length


52 +2
Ø35
22 ±2
9,5
21,3
PG9
C
A
B
24 ±2
Ø10
Ø8 H7
Ø24
12
9
25°
1
2
3
4


36,5 max.
Ø35
Ø5
22 ±2
21 max.
9,5
21,3
C
A
B
24 ±2
Ø10
Ø8 H7
Ø24
12
9
25°


1 / brown
2 / black
3 / red

Schematic

Type designations	LWX 0050	LWX 0075	LWX 0100	LWX 0150	LWX 0175	LWX 0225	LWX 0250	LWX 0300	LWX 0360	LWX 0450	LWX 0500	LWX 0600	LWX 0750	
Electrical Data														
Defined electrical range	50	75	100	150	175	225	250	300	360	450	500	600	750	mm
Electrical stroke	52	77	102	152	178	229	254	305	366	457	508	610	762	mm
Nominal resistance	2	3	3	5	5	5	5	5	5	5	5	5	10	kΩ
Reistance toleranz	20													± %
Independent linearity	0.2	0.1	0.1	0.08	0.07	0.07	0.07	0.06	0.05	0.05	0.05	0.05	0.04	± %
Repeatability	0,01													mm
Recommended operating wiper current	≤1													µA
Max. wiper current in case of malfunction	10													mA
Max. permissible applied voltage	42													V
Effective temperature coefficient of the output-to-applied voltage ratio	typical 5													ppm/K
Insulation reistance (500 VDC)	≥ 10													MΩ
Dielectric strength (500 VAC, 50 Hz)	≤ 100													µA
Mechanical Data														
Body length (dimension A)	178	203	229	279	305	356	381	432	507	621	686	812	996	± 2 mm
Mechanical stroke (dimension B)	56	81	107	157	183	233	259	309	370	462	512	614	766	± 2 mm
Minimum distance between pivot heads, nominal (dimension C)	224	249	275	325	351	402	427	478	553	667	732	858	1042	mm
Weight with connector approx.	413	453	493	573	613	693	733	832	1023	1167	1247	1407	1647	g
Operating force horizontal vertical	 typical 50 typical 50													 N N
Tearing force horizontal	 150 *)													 N

Environmental Data

Temperature range	-30...+100	°C
Operating humidity range	0... 95 (no condensation)	% R.H.
Vibration	5...2000 Amax =0.75 amax =20	Hz mm g
Shock	50 11	g ms
Life	>50 x 10^6 typical	movements
Operating speed	5	m/s max.
Protection class	IP 67 (DIN EN 60529), also dynamic	

*) Depending on the environmental temperature and standstill time, the necessary force for the initial operating of the push rod can increase.

Order designations (connector version) *		Order designations (cable version) *	
Type	**P/N**	**Type**	**P/N**
LWX-0050-003-101	026302	LWX-0050-003-201	026402
LWX-0075-003-101	026303	LWX-0075-003-201	026403
LWX-0100-003-101	026304	LWX-0100-003-201	026404
LWX-0150-003-101	026306	LWX-0150-003-201	026406
LWX-0175-003-101	026307	LWX-0175-003-201	026407
LWX-0225-003-101	026309	LWX-0225-003-201	026409
LWX-0250-003-101	026310	LWX-0250-003-201	026410
LWX-0300-003-101	026312	LWX-0300-003-201	026412
LWX-0360-003-101	026314	LWX-0360-003-201	026414
LWX-0450-003-101	026318	LWX-0450-003-201	026418
LWX-0500-003-101	026320	LWX-0500-003-201	026420
LWX-0600-003-101	026324	LWX-0600-003-201	026424
LWX-0750-003-101	026330	LWX-0750-003-201	026430

*) Stainless steel pivot heads on request

Important
All values specified in this data sheet for linearity, lifetime and temperature coefficient are only valid for a sensor used as a voltage divider with virtually no load applied to the wiper (Ie < 1 µA).


Female connector, angled

Included in delivery (connector version)
M12x1 female connector, angled, with coupling nut, screw termination, 4x0.75mm², cable diameter 6 ... 8 mm, IP67, not shieldable, EEM 33-89


Female connector, angled

Recommended accessories
M12x1 female connector, 4-pin, angled, with molded cable, shielded, 4x0,34 mm², IP67, open ended:
length 2 m, EEM 33-33, P/N 005601;
length 5 m, EEM 33-63, P/N 005610;
length 10 m, EEM 33-99, P/N 005696.
(other versions see data sheet Accessories M12-connection system)


Pivot head Z-G-03

Recommended accessories
Conversion kit: stainless steel version of pivot heads
P/N 108551 Z-G-03


Signal conditioner e.g. MUP-110

Recommended accessories
Process-controlled indicators MAP... with display,
Signal conditioner MUP... / MUK … for standardized output signals.

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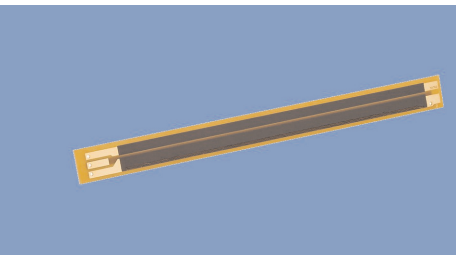
Resistance Elements up to 300 mm

Series PTX



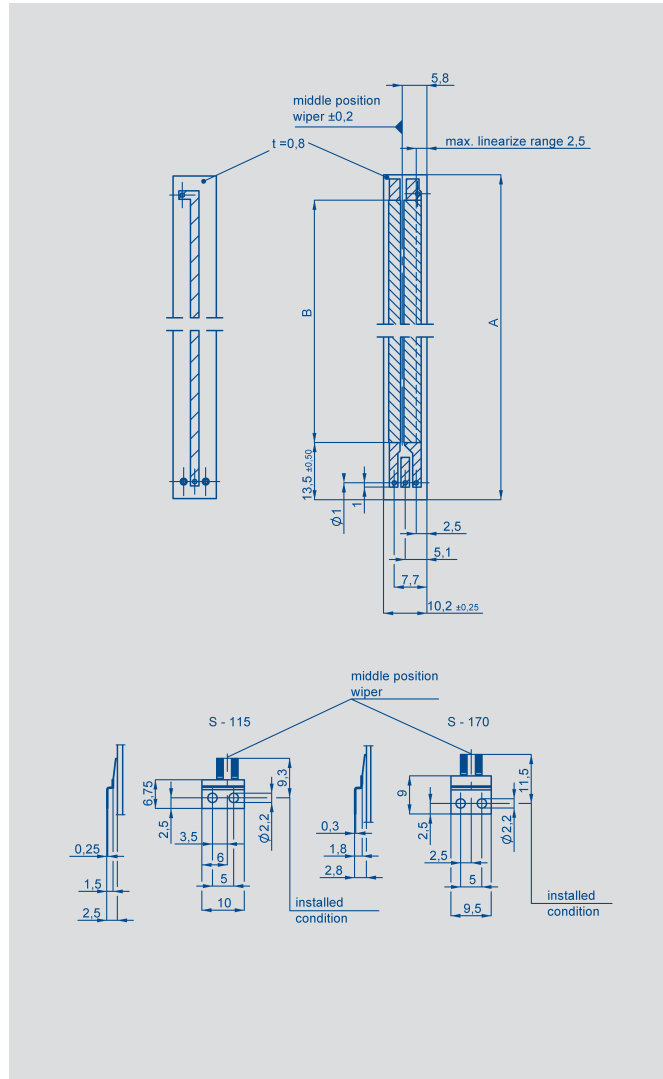
Special features
- suitable for mounting in closed applications
- easy mounting by bonding or clamping
- outstanding linearity
- very long life

Translational resistance elements suitable for installation in closed devices, which are so compact built, that for a position transducer with housing and actuating rod no sufficient place is available. Positioning drives represent a typical field of application.

The mounting of the resistance element should be on an even, clean surface in correct position to the wiper as indicated in the dimensional drawing.

In addition, the stated distance between the wiper carrier and the resistance element must be adhered to. Thus ensure the necessary wiper tracking force as well as the operatbility and durability. Two different wiper designs are available.

Only the standard lengths are specified in this data sheet. Other lengths and outlines of the resistance elements on request.



Description	
Substrate	glass filled epoxy
Resistance element and collector	conductive plastic
Wiper	precious metal multi-finger wiper
Electrical connections	lead wires to be soldered onto soldering eyelet of resistance element

Important
All values specified in this data sheet for linearity, lifetime and temperature coefficient are only valid for a sensor used as a voltage divider with virtually no load applied to the wiper ($I_e \leq 1$ µA).

Mounting instruction
Pay attention to isolate the conductive track on the back side of resistance element.

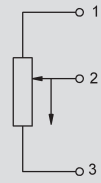
Type designations	PTX 0010	PTX 0025	PTX 0050	PTX 0075	PTX 0100	PTX 0125*	PTX 0150	PTX 0175*	PTX 0200	PTX 0250	PTX 0300	
Electrical Data												
Defined electrical range	10	25	50	75	100	125	150	175	200	250	300	mm
Electrical range	12	27	52	77	102	130	155	180	205	255	305	±0.1 mm
Total resistance	1	1	2	3	4	5	6	7	8	10	12	kΩ
Resistance tolerance	20											±%
Independent linearity	0.25	0.2	0.1	0.1	0.1	0.05	0.05	0.05	0.05	0.05	0.05	±%
Repeatability	0,01											mm
Recommended operating wiper current	≤ 1											µA
Max. wiper current in case of malfunction	10											mA
Max. permissible applied voltage	42											V
Temperature coefficient of the output-to-applied voltage ratio	typ. 5											ppm/K
Insulation resistance (500 VDC)	≥ 10											MΩ
Dielectric strength (500 VAC, 50 Hz)	≤ 100											µA
Mechanical Data												
Mechanical range (Dimension B)	15.5	30.5	55.5	80.5	105.5	133,5	158.5	183.5	208.5	258.5	308.5	mm
Total length (Dimension A)	35	50	75	100	125	153	178	203	228	278	328	±0.4 mm
Environmental Data												
Temperature range	-40 ... +100											°C
Operating humidity range	0...95 (no condensation)											% R.H.
Life	> 50 x 10^6 typ.											cycles

Order designations

Type	Art.-No.
PTX 0010	022301
PTX 0025	022302
PTX 0050	022303
PTX 0075	022304
PTX 0100	022305
PTX 0125*	022306
PTX 0150	022307
PTX 0175*	022308
PTX 0200	022309
PTX 0250	022311
PTX 0300	022313
Wiper S-115	002161
or Wiper S-170	021110

When ordering please indicate art.no. for resistance element and corresponding wiper.

*) on request



Schematic

По вопросам продаж и поддержки обращайтесь:

Алматы (727)345-47-04
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
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Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Сыктывкар (8212)25-95-17
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Казахстан +7(727)345-47-04
Беларусь +(375)257-127-884
Узбекистан +998(71)205-18-59
Киргизия +996(312)96-26-47

эл.почта: nkf@nt-rt.ru || сайт: https://novotechnik.nt-rt.ru/