

## Preliminary Data sheet

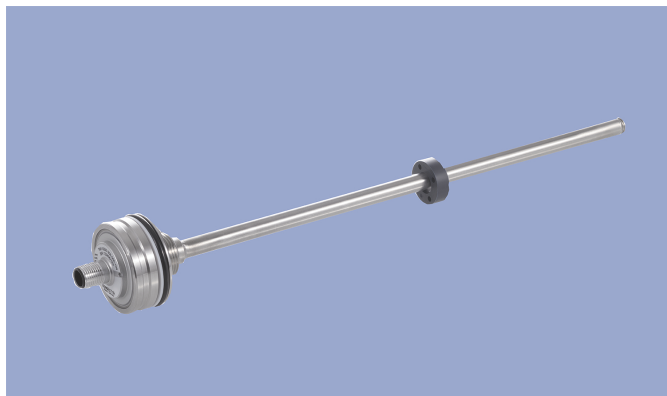
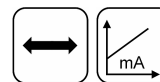
### NOVOSTRICTIVE Transducer Touchless

#### TM1

Plug-in Flange

4 ... 20 mA

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: AISiMgBi 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

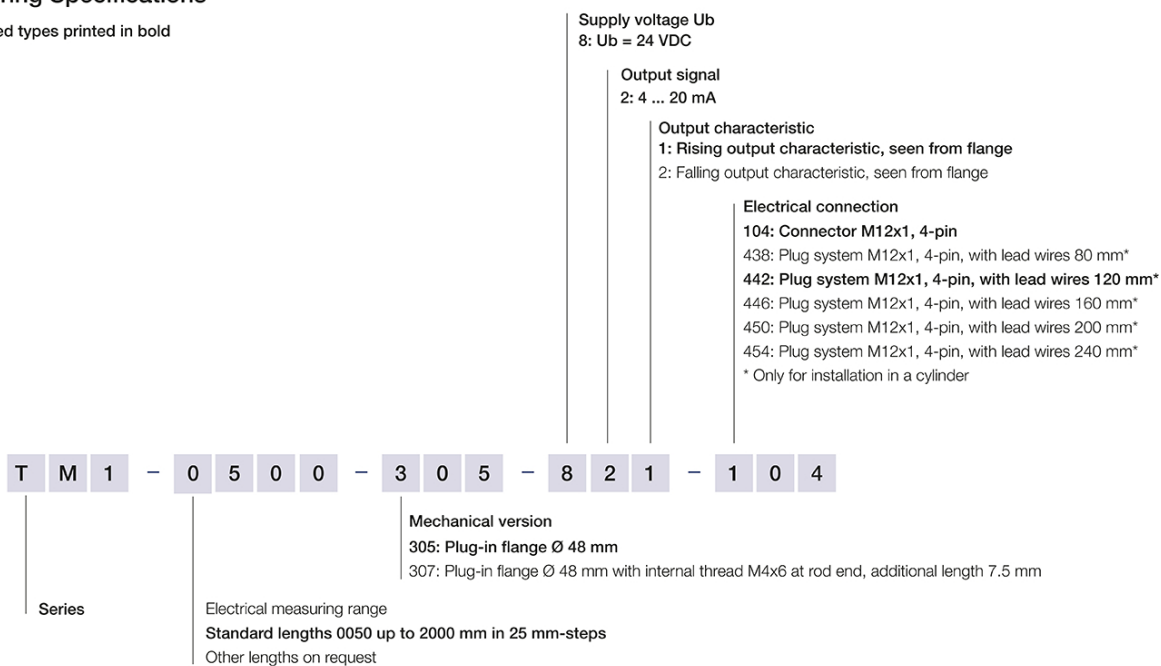
#### Mechanical Data

Dimensions	See dimension drawing
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## Ordering Specifications

### Ordering Specifications

Preferred types printed in bold





## Technical Data

Type	TM1-____-305-82-__
Output signal	4 ... 20 mA
Load / 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

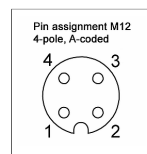
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 10 ... 2000 Hz, Amax = 0.75 mm
Shock IEC 60068-2-27	100 g, 11 ms (single hit)
Protection class DIN EN 60529	IP67 / IP6K9K (connector M12: IP67)
Operating temperature	-40 ... +105°C, -40 ... +85°C (connector system M12)
Operating 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)	> 20 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.

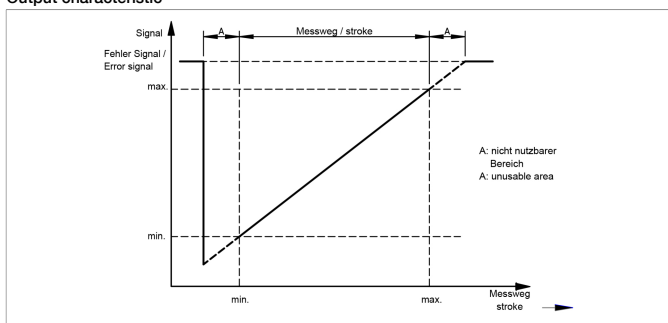
### Connection Assignment

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		

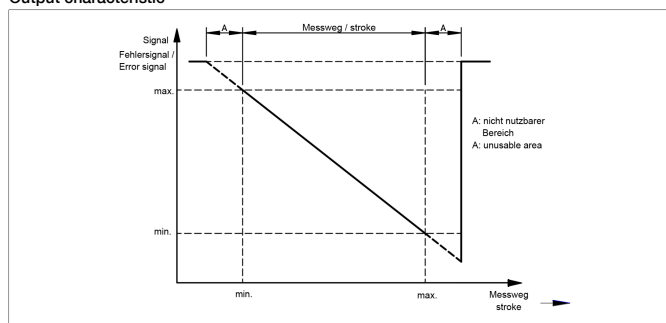


**Technical Data  
Output  
Characteristics**

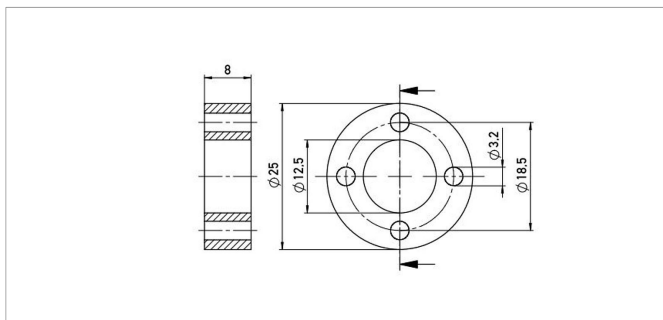
Output characteristic



Output characteristic



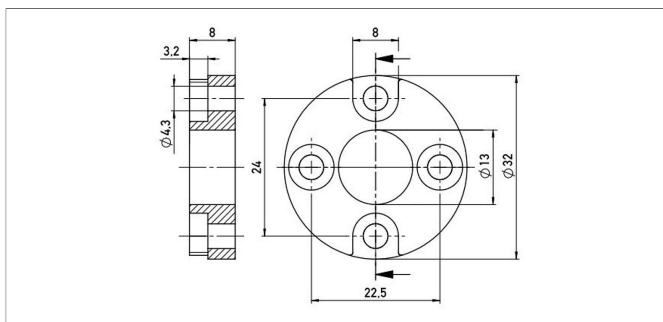
## Position Markers



### 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/mm<sup>2</sup>  
Fastening torque max. 100 Ncm  
of mounting

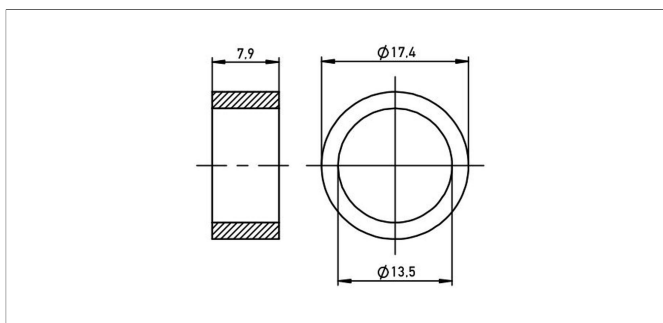
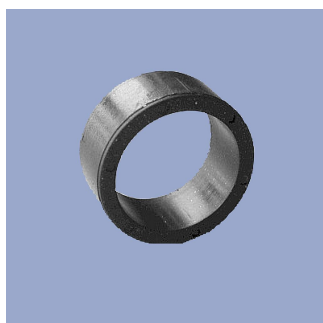
P/N	Pack. unit [pcs]
400005697	1



### Z-TH1-P19

Ring position marker for fixation with screws M4  
Material PA6-GF  
Weight approx. 14 g  
Operating temp. -40 ... +100°C  
Surface pressure max. 40 N/mm<sup>2</sup>  
Fastening torque max. 100 Ncm  
of mounting

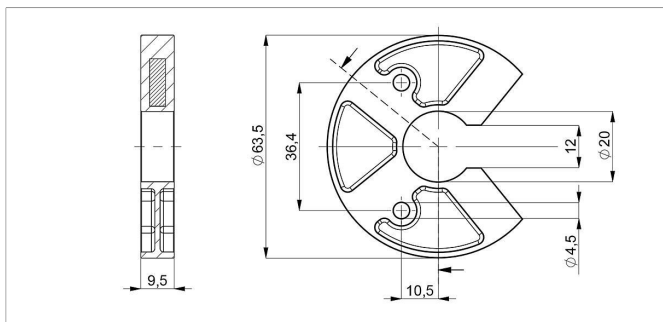
P/N	Pack. unit [pcs]
400005698	1



### Z-TIM-P20

Ring position marker for mounting via lock washer and retaining ring  
Material PA-Neonbond Compound  
Weight approx. 5 g  
Operating temp. -40 ... +100°C  
Surface pressure max. 10 N/mm<sup>2</sup>

P/N	Pack. unit [pcs]
400005699	1



### Z-TH1-P25

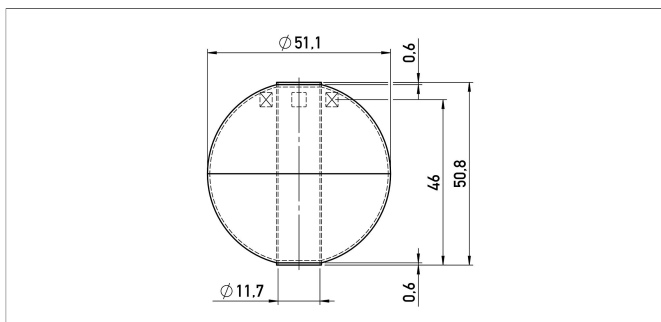
U-shaped position marker for fixation with M4 screws

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/mm<sup>2</sup>  
Fastening torque max. 100 Ncm  
of mounting

P/N	Pack. unit [pcs]
400105076	1

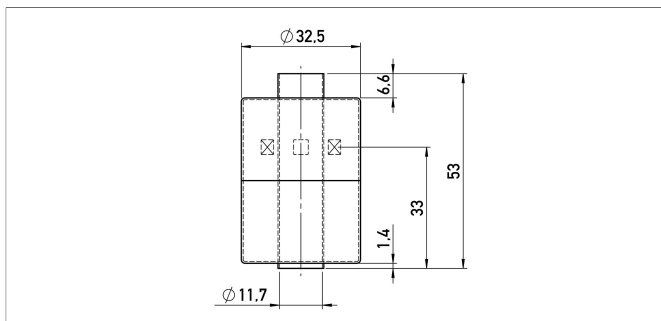
## Position Markers



### Z-TH1-P32

Ball-type floating position marker  
Material Stainless steel 1.4571  
Weight approx. 42 g  
Operating temp. -40 ... +100°C  
Compression strength  $\leq 40$  bar  
Density 720 kg/m<sup>3</sup>  
Immersion depth in water 36.7 mm

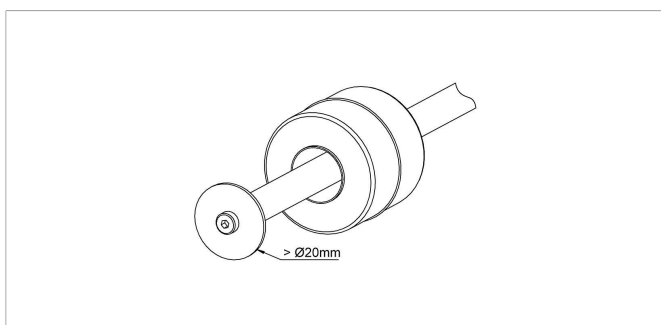
P/N	Pack. unit [pcs]
400105703	1



### Z-TH1-P31

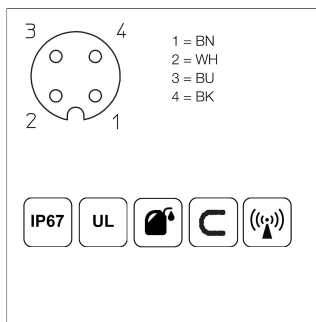
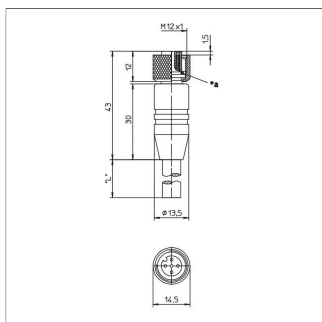
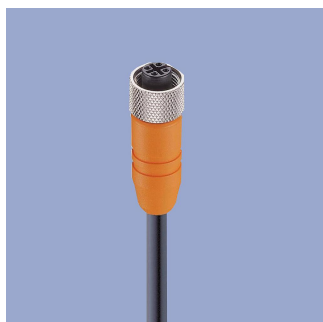
Cylinder floating position marker  
Material Stainless steel 1.4404  
Weight approx. 20 g  
Operating temp. -40 ... +100°C  
Compression strength  $\leq 24$  bar  
Density 740 kg/m<sup>3</sup>  
Immersion depth in water approx. 26.6 mm

P/N	Pack. unit [pcs]
400105704	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

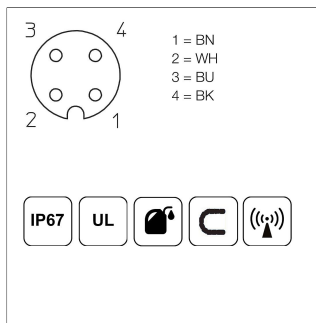
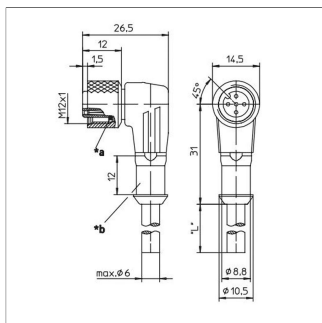
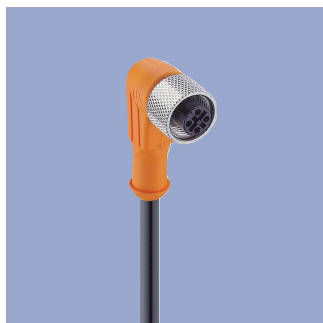


**EEM-33-32/62/97**  
M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

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

Lead wires PP, 0.34 mm<sup>2</sup>

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 mm<sup>2</sup>

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 Compatibility (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

**C** Suited for applications in dragchains

**UL** UL - approved

CAN-Bus



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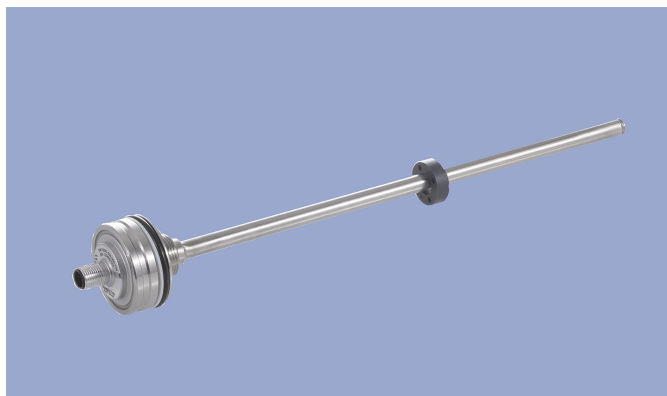
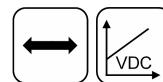
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The specifications contained in our datasheets are intended solely for informational purposes. The documented specification values are based on ideal operational and environmental conditions and can vary significantly depending on the actual customer application. Using our products at or close to one or more of the specified performance ranges can lead to limitations regarding other performance parameters. It is therefore necessary that the end user verifies relevant performance parameters in the intended application. We reserve the right to change product specifications without notice.

## Preliminary Data sheet

### NOVOSTRICTIVE Transducer Touchless

**TM1**  
Plug-in Flange  
Voltage  
**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

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#### 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
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## Ordering Specifications

### Ordering Specifications

Preferred types printed in bold

Supply voltage  $U_b$   
8:  $U_b = 24$  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**

Series

Electrical measuring range

**Standard lengths 0050 up to 2000 mm in 25 mm-steps**

Other lengths on request

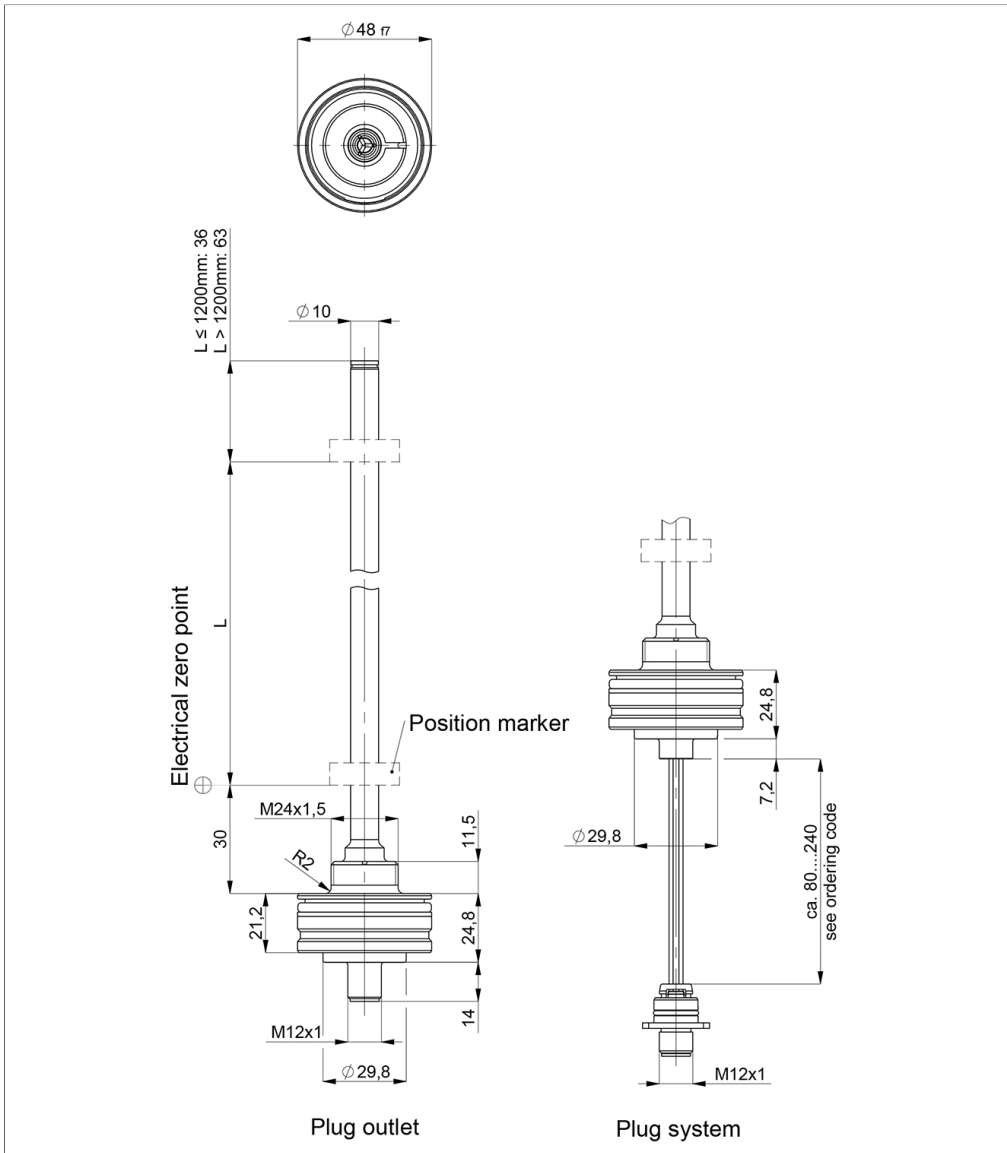
Mechanical version

**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

**Drawing**

CAD data see  
[www.novotechnik.de/en/download/cad-data/](http://www.novotechnik.de/en/download/cad-data/)



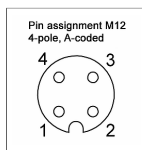
## Technical Data

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 / burden	≥ 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	
<b>Environmental Data</b>		
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 / IP6K9K (connector M12: IP67)	
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)	> 20 years	> 20 years
<b>EMC Compatibility</b>		
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.	

### Connection Assignment

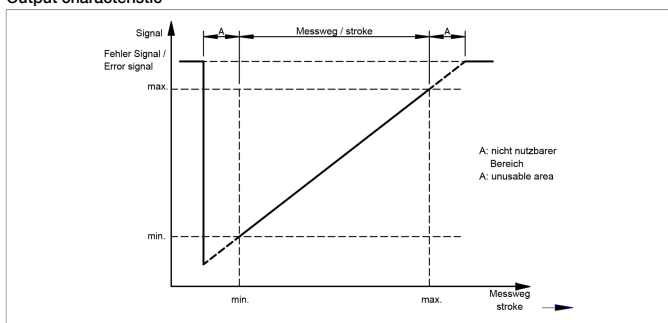
Signal	Connector code 1__	Plug system code 4__
Supply voltage Ub	Pin 1	Pin 1
GND	Pin 3	Pin 3
Signal output	Pin 2	Pin 2
Do not connect	Pin 4	Pin 4

Connect cable shielding to protection earth

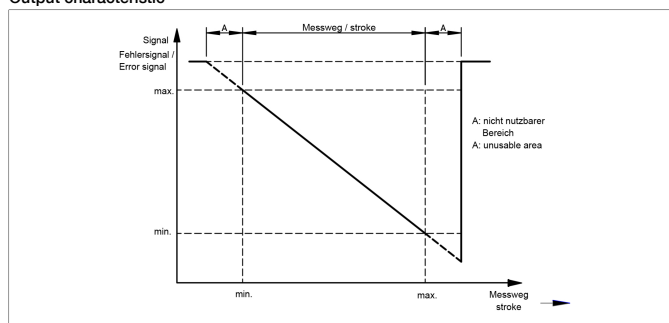


**Technical Data  
Output  
Characteristics**

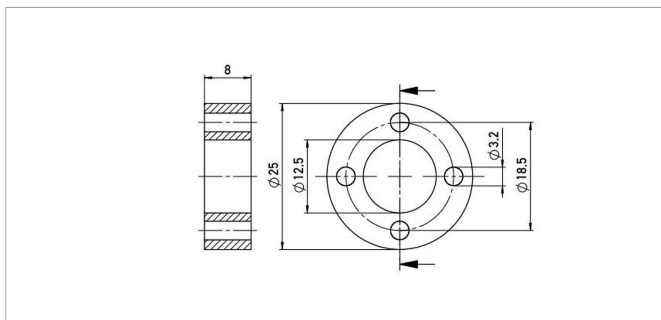
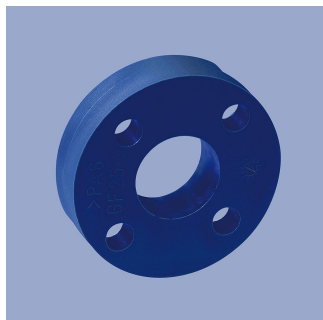
Output characteristic



Output characteristic



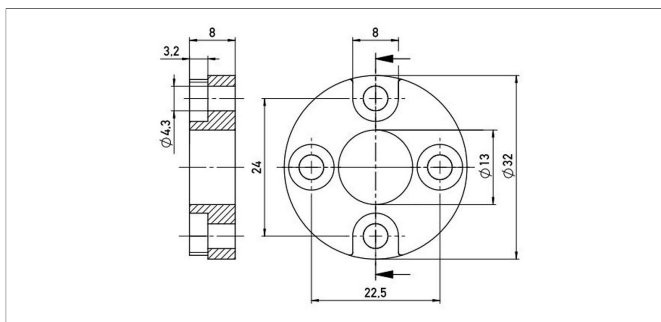
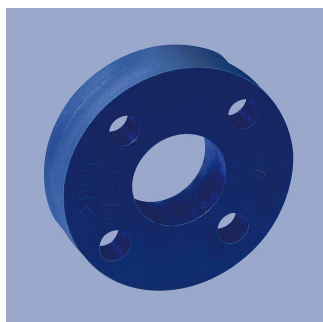
## Position Markers



### 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/mm<sup>2</sup>  
 Fastening torque max. 100 Ncm  
 of mounting

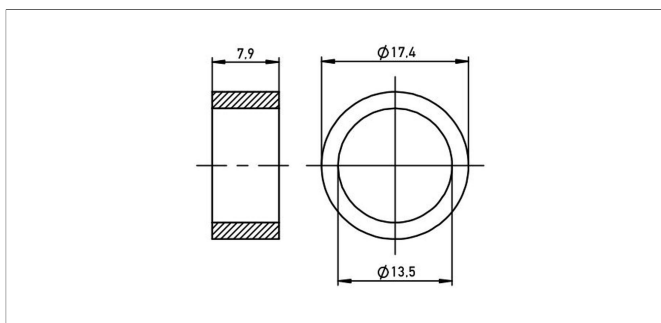
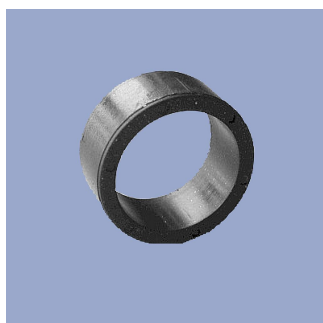
P/N	Pack. unit [pcs]
400005697	1



### Z-TH1-P19

Ring position marker for fixation with screws M4  
 Material PA6-GF  
 Weight approx. 14 g  
 Operating temp. -40 ... +100°C  
 Surface pressure max. 40 N/mm<sup>2</sup>  
 Fastening torque max. 100 Ncm  
 of mounting

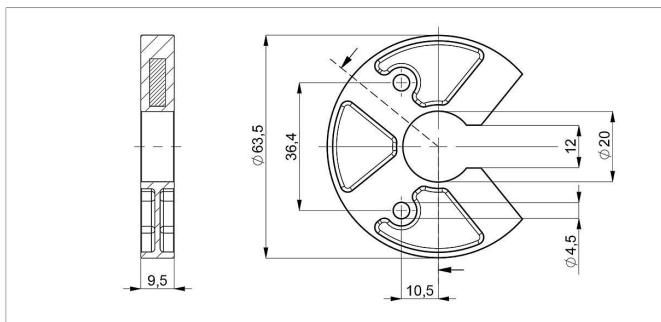
P/N	Pack. unit [pcs]
400005698	1



### Z-TIM-P20

Ring position marker for mounting via lock washer and retaining ring  
 Material PA-Neonbond Compound  
 Weight approx. 5 g  
 Operating temp. -40 ... +100°C  
 Surface pressure max. 10 N/mm<sup>2</sup>

P/N	Pack. unit [pcs]
400005699	1



### Z-TH1-P25

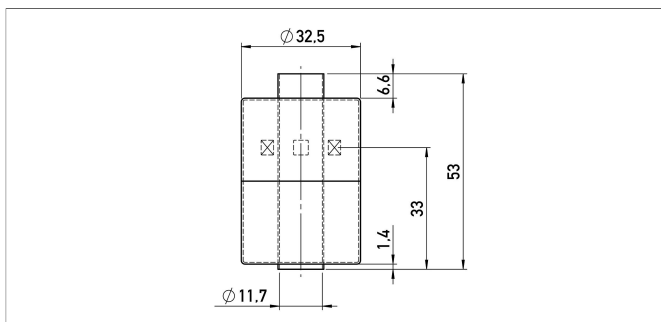
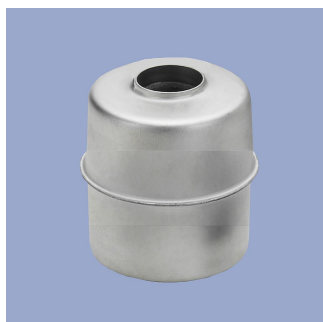
U-shaped position marker for fixation with M4 screws

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/mm<sup>2</sup>  
 Fastening torque max. 100 Ncm  
 of mounting

P/N	Pack. unit [pcs]
400105076	1

## Position Markers



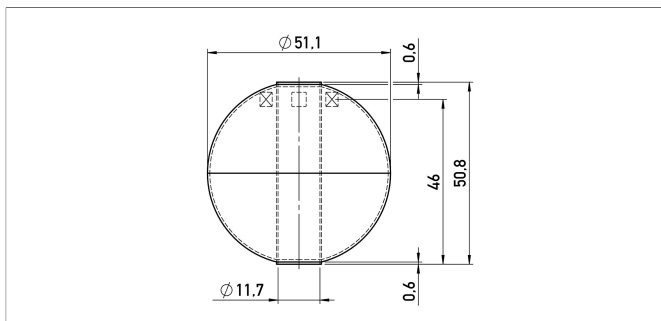
### Z-TH1-P31

Cylinder floating position marker  
Material Stainless steel 1.4404  
Weight approx. 20 g  
Operating temp. -40 ... +100°C  
Compression strength  $\leq 24$  bar  
Density 740 kg/m<sup>3</sup>  
Immersion depth in water approx. 26.6 mm

P/N	Pack. unit [pcs]
400105704	1

400105704

1



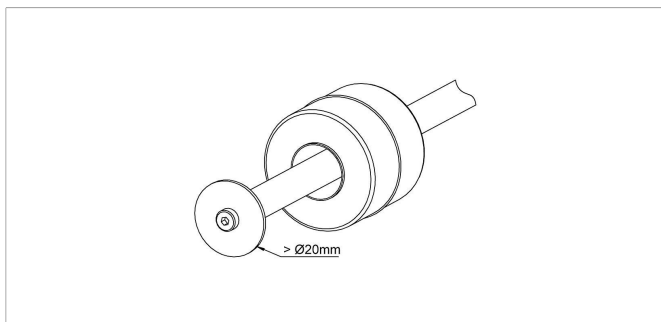
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Ball-type floating position marker  
Material Stainless steel 1.4571  
Weight approx. 42 g  
Operating temp. -40 ... +100°C  
Compression strength  $\leq 40$  bar  
Density 720 kg/m<sup>3</sup>  
Immersion depth in water 36.7 mm

P/N	Pack. unit [pcs]
400105703	1

400105703

1

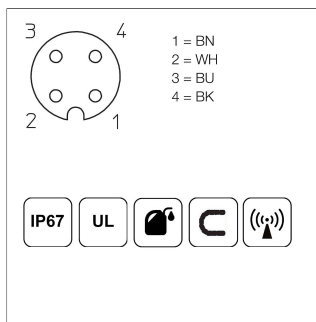
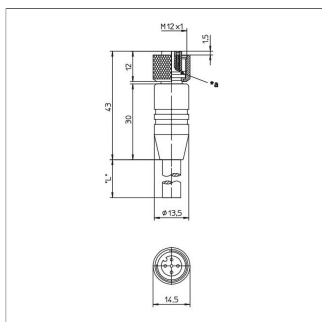
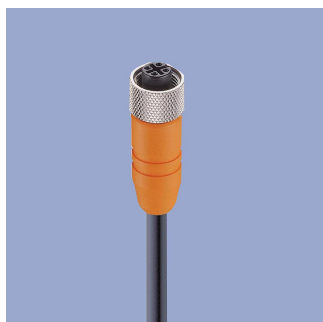


When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.

For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).



## Connector System M12

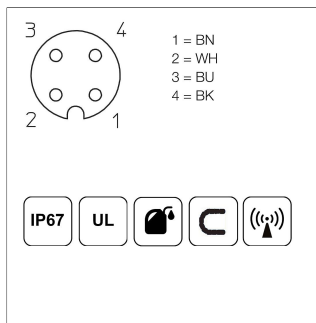
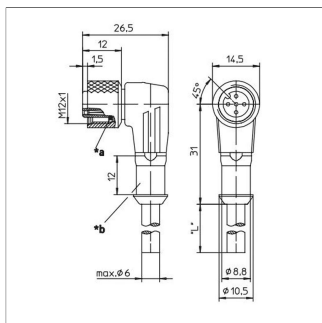
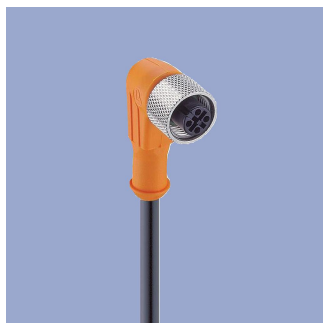


**EEM-33-32/62/97**  
M12x1 Mating female connector, 4-pin, straight,  
A-coded, with molded cable, shielded, IP67,  
open ended

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

Lead wires PP, 0.34 mm<sup>2</sup>

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 mm<sup>2</sup>

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 Compatibility (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

**C** Suited for applications in dragchains

**UL** UL - approved

CAN-Bus

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The specifications contained in our datasheets are intended solely for informational purposes. The documented specification values are based on ideal operational and environmental conditions and can vary significantly depending on the actual customer application. Using our products at or close to one or more of the specified performance ranges can lead to limitations regarding other performance parameters. It is therefore necessary that the end user verifies relevant performance parameters in the intended application. We reserve the right to change product specifications without notice.

## Preliminary Data sheet

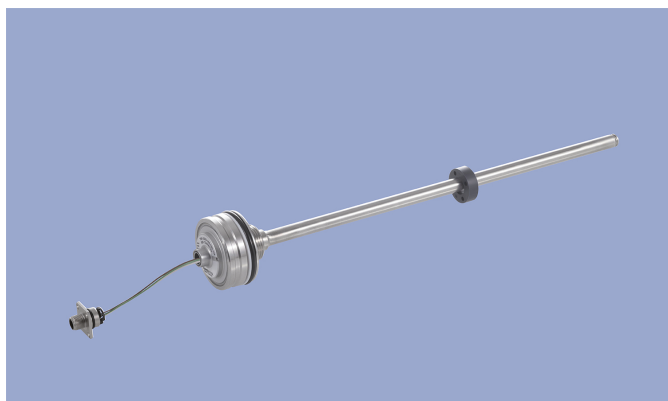
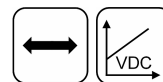
### NOVOSTRICTIVE Transducer Touchless

#### 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 / Connector system M12x1, A-coded with lead wires / Cable 3x 0.5 mm <sup>2</sup> (AWG 20), PUR, unshielded

#### Mechanical Data

Dimensions	See dimension drawing
------------	-----------------------

## Ordering Specifications

### Ordering Specifications

Preferred types printed in bold

Supply voltage  $U_b$   
8:  $U_b = 12/24$  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, 1 m**

253: Cable, 3-pole, unshielded, 3 m

255: Cable, 3-pole, unshielded, 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**

Series

**Mechanical version**

305: **Plug-in flange Ø 48 mm**

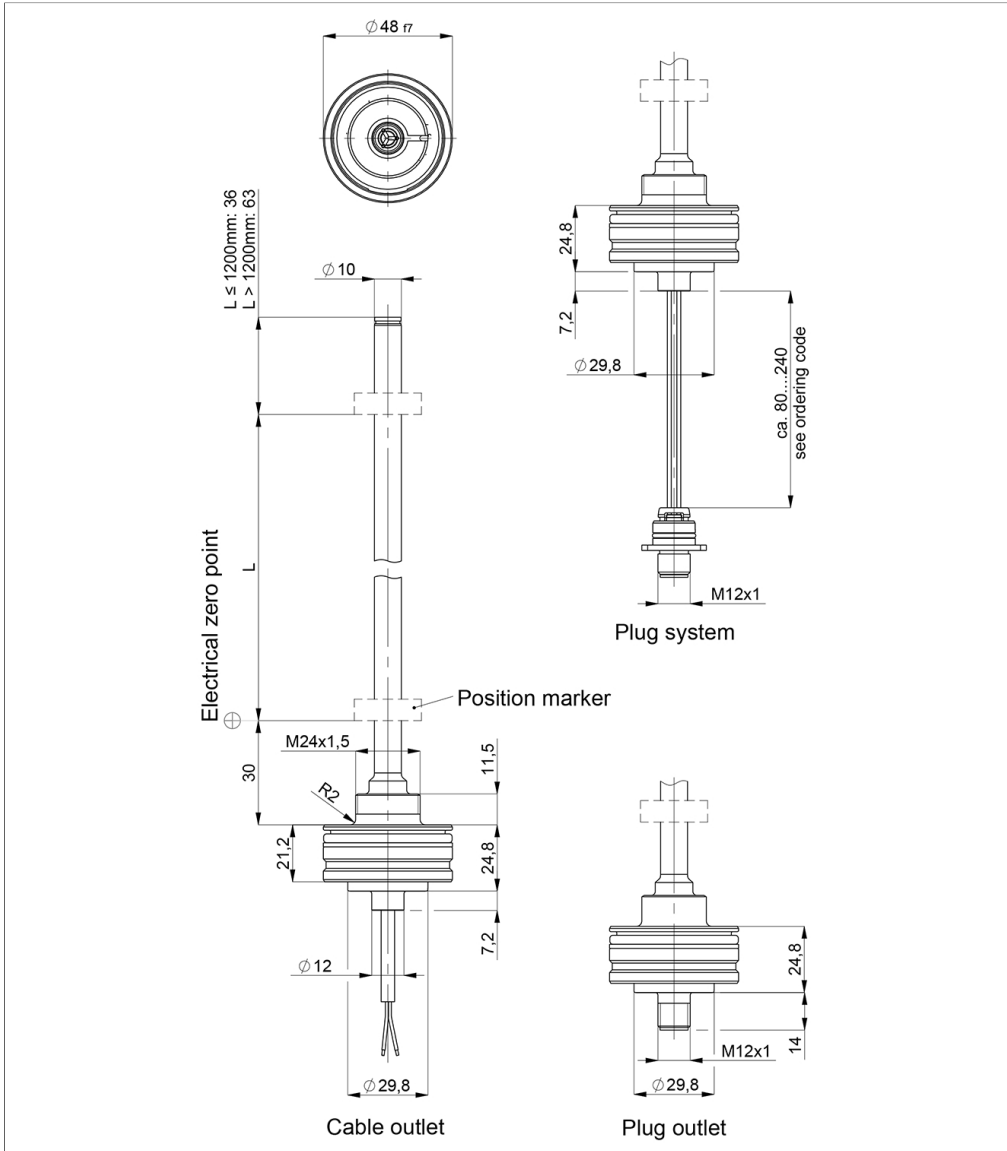
307: Plug-in flange Ø 48 mm with internal thread M4x6 at rod end, additional length 7.5 mm

**Electrical measuring range**

Standard lengths 0050 up to 2000 mm in 25 mm-steps

Other lengths on request

**Drawing**



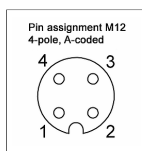
CAD data see  
[www.novotechnik.de/en/download/cad-data/](http://www.novotechnik.de/en/download/cad-data/)

## 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 / burden	≥ 10 kΩ	
Update rate	0.5 kHz	
Measuring range	0 ... 50 mm up to 0 ... 2000 mm	
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	
<b>Environmental Data</b>		
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 / IP6K9K (connector M12 / cable: IP67)	
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)	> 20 years	> 20 years
<b>EMC Compatibility</b>		
ISO 10605 ESD (Handling/Component)	8 kV / 15 kV	
ISO 11452-2 Radiated HF-fields	100 V/m	
ISO 11452-5 Radiated HF-Fields, stripline	200 V/m	
CISPR 25 Radiated emission	Level 5	
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b) Level 4	
ISO 16750 Pulses on supply lines	(4, 5) Level 4	
ISO 7637-2 Transient Emissions	Level 3	
ISO 7637-3 Pulses on output lines	Level 4	
EN 13309 Construction machinery		
ISO 14982 Agricult./forestry machines		
The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.		

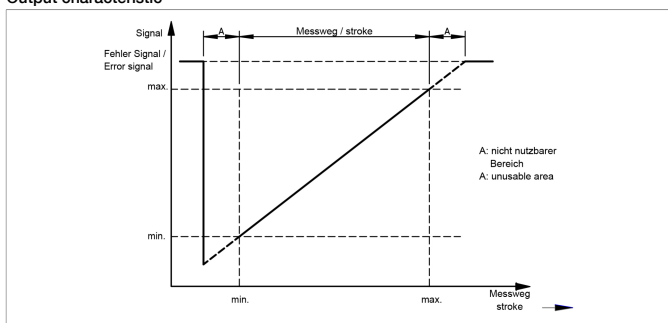
### Connection Assignment

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

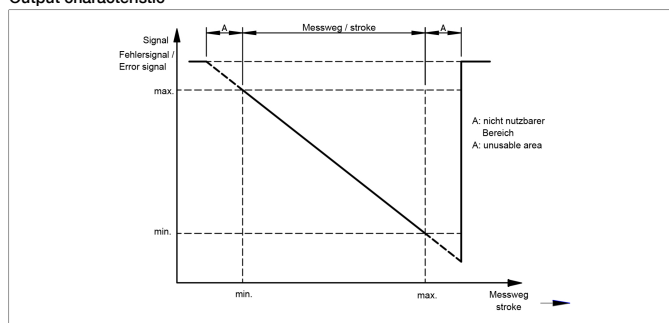


**Technical Data  
Output  
Characteristics**

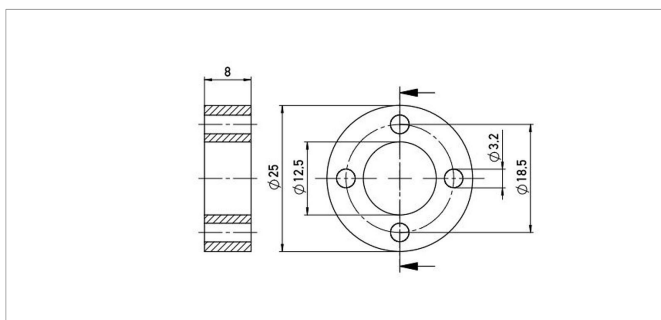
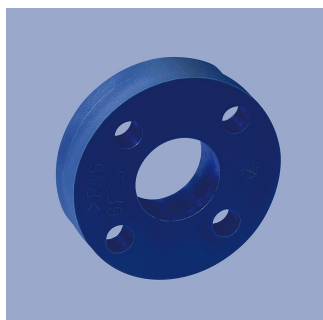
Output characteristic



Output characteristic



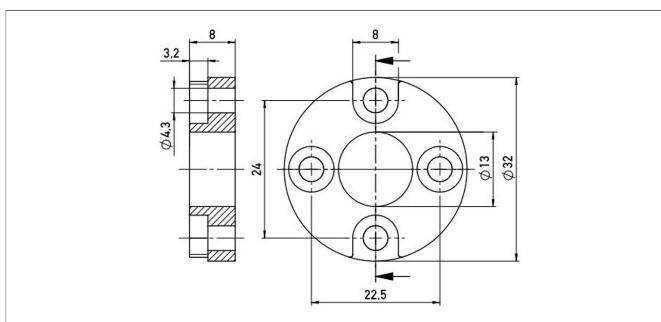
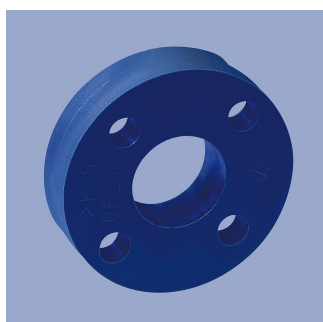
## Position Markers



### 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/mm<sup>2</sup>  
Fastening torque max. 100 Ncm  
of mounting

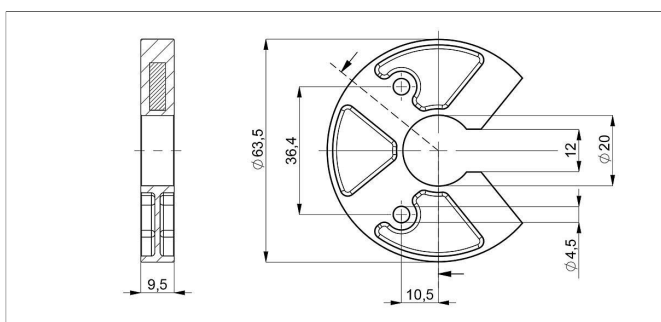
P/N	Pack. unit [pcs]
400005697	1



### Z-TH1-P19

Ring position marker for fixation with screws M4  
Material PA6-GF  
Weight approx. 14 g  
Operating temp. -40 ... +100°C  
Surface pressure max. 40 N/mm<sup>2</sup>  
Fastening torque max. 100 Ncm  
of mounting

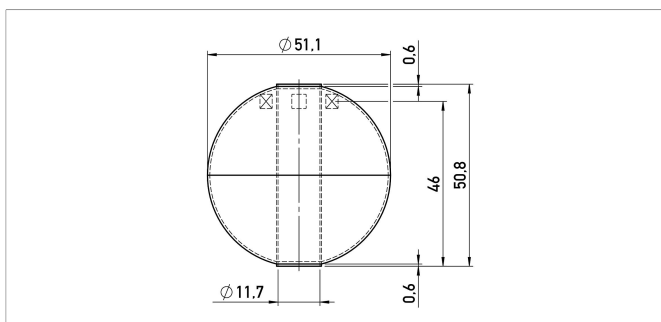
P/N	Pack. unit [pcs]
400005698	1



### 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/mm<sup>2</sup>  
Fastening torque max. 100 Ncm  
of mounting

P/N	Pack. unit [pcs]
400105076	1



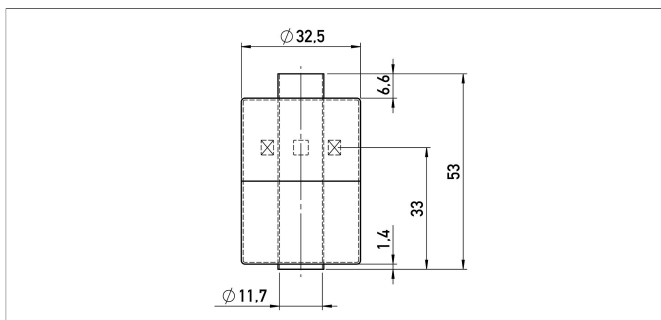
### Z-TH1-P32

Ball-type floating position marker  
Material Stainless steel 1.4571  
Weight approx. 42 g  
Operating temp. -40 ... +100°C  
Compression strength  $\leq 40$  bar  
Density 720 kg/m<sup>3</sup>  
Immersion depth 36.7 mm  
in water

P/N	Pack. unit [pcs]
400105703	1



## Position Markers



### Z-TH1-P31

Cylinder floating position marker

Material Stainless steel 1.4404

Weight approx. 20 g

Operating temp. -40 ... +100°C

Compression  $\leq 24$  bar

strength

Density 740 kg/m<sup>3</sup>

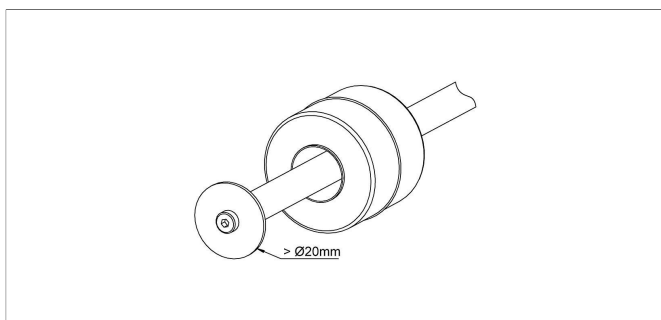
Immersion depth approx. 26.6 mm

in water

P/N	Pack. unit [pcs]
400105704	1

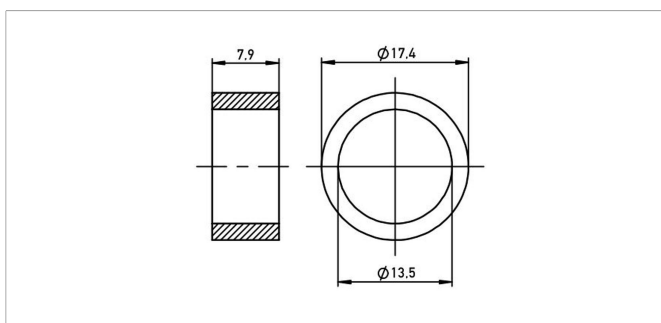
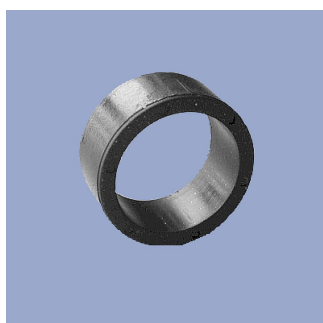
400105704

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-TIM-P20

Ring position marker for mounting via lock washer and retaining ring

Material PA-Neonbond Compound

Weight approx. 5 g

Operating temp. -40 ... +100°C

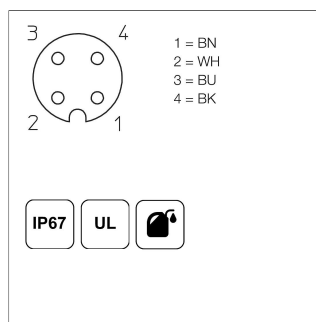
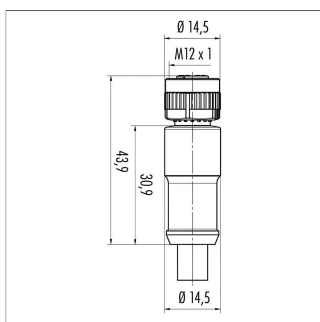
Surface pressure max. 10 N/mm<sup>2</sup>

P/N	Pack. unit [pcs]
400005699	1

400005699

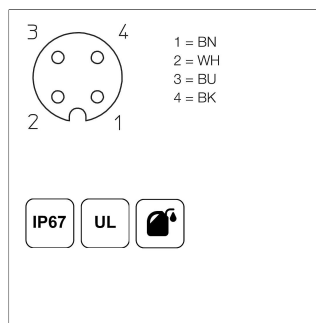
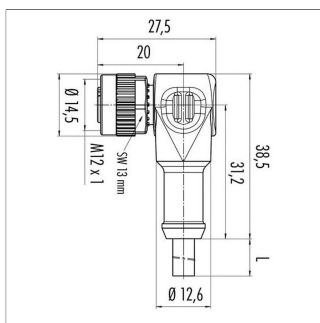
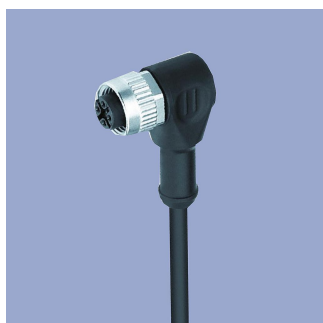
1

## 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 mm<sup>2</sup>

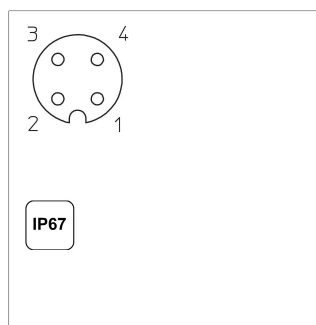
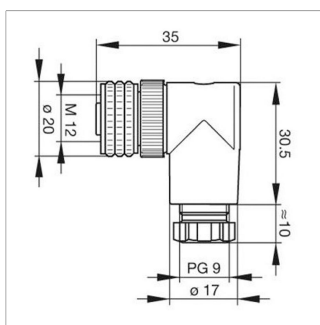
P/N	Type	Length
400056135	EEM-33-35	2 m
400056136	EEM-33-36	5 m
400056137	EEM-33-37	10 m



**EEM-33-38/39/40**  
M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, not shielded, IP67, open ended

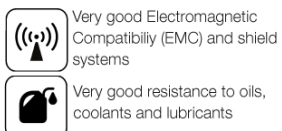
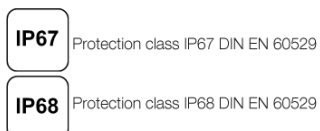
Plug housing PA  
Cable sheath PUR, Ø = max. 6 mm, -40 ... +85°C (fixed)  
Lead wires PP, 0.34 mm<sup>2</sup>

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 mm<sup>2</sup>

P/N	Type
400005634	EEM-33-89



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## Preliminary Data sheet

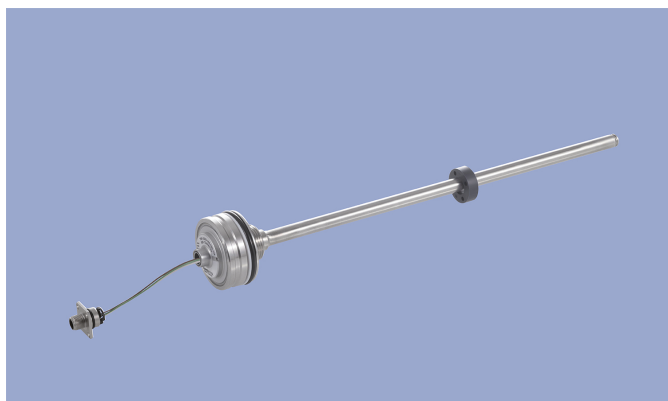
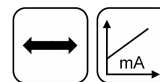
### NOVOSTRICTIVE Transducer Touchless

#### 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
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#### Applications

Hydraulic or pneumatic cylinders in

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- 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 mm <sup>2</sup> (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  $U_b$   
8:  $U_b = 12/24$  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, 1 m**
- 253: Cable, 3-pole, unshielded, 3 m
- 255: Cable, 3-pole, unshielded, 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**

Series

Electrical measuring range

**Standard lengths 0050 up to 2000 mm in 25 mm-steps**

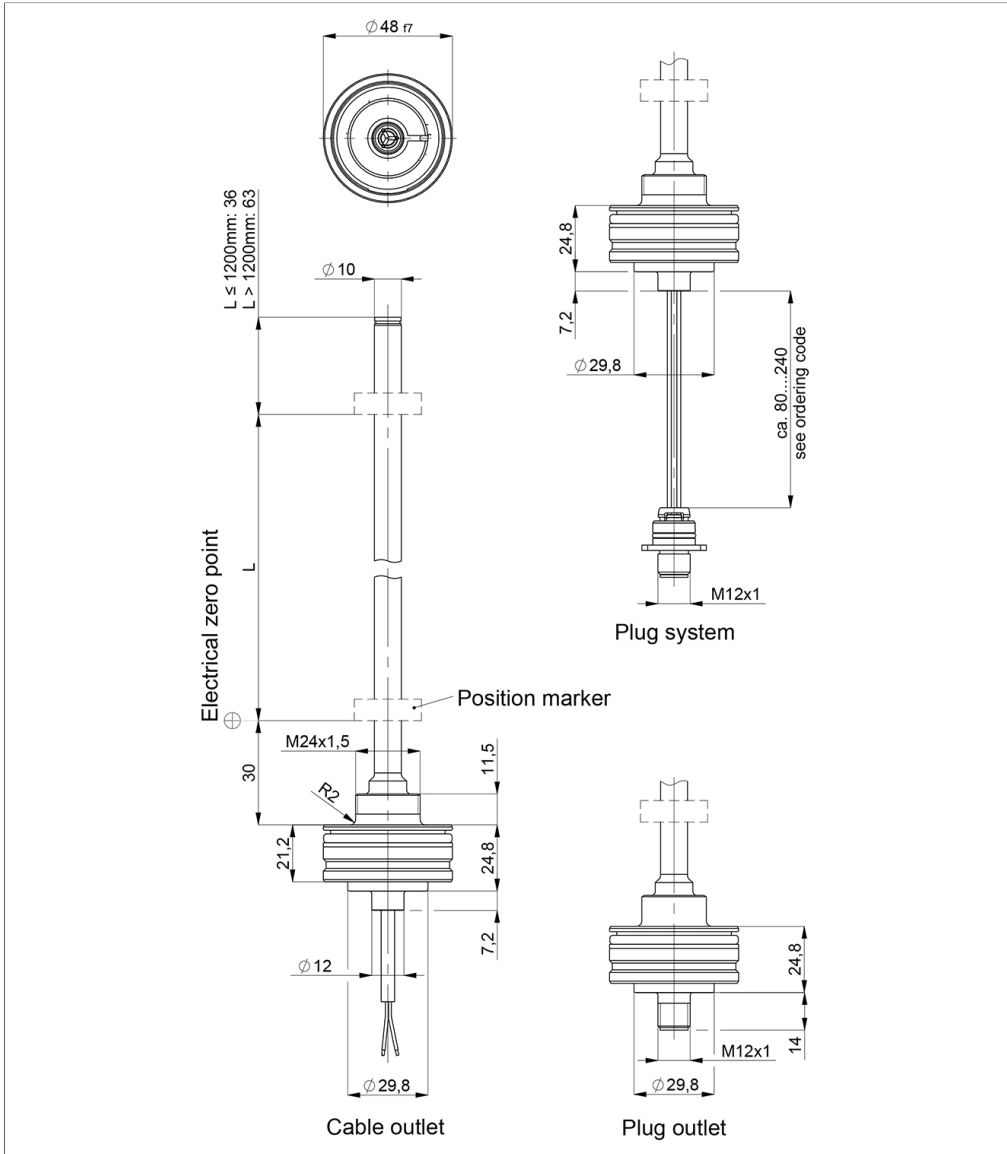
Other lengths on request

**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

**Drawing**



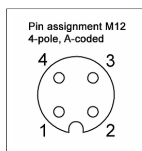
CAD data see  
[www.novotechnik.de/en/download/cad-data/](http://www.novotechnik.de/en/download/cad-data/)

## Technical Data

<b>Type</b>	<b>TM1-____-305-82-_-_-</b>
Output signal	4 ... 20 mA
Load / 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
<b>Environmental Data</b>	
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 / IP6K9K (connector M12 / cable: IP67)
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)	> 20 years
<b>EMC Compatibility</b>	
ISO 10605 ESD (Handling/Component)	8 kV / 15 kV
ISO 11452-2 Radiated HF-fields	100 V/m
ISO 11452-5 Radiated HF-Fields, stripline	200 V/m
CISPR 25 Radiated emission	Level 4
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b) Level 4
ISO 16750 Pulses on supply lines	(4, 5) Level 4
ISO 7637-2 Transient Emissions	Level 3
ISO 7637-3 Pulses on output lines	Level 4
EN 13309 Construction machinery	
ISO 14982 Agricult./forestry machines	
The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.	

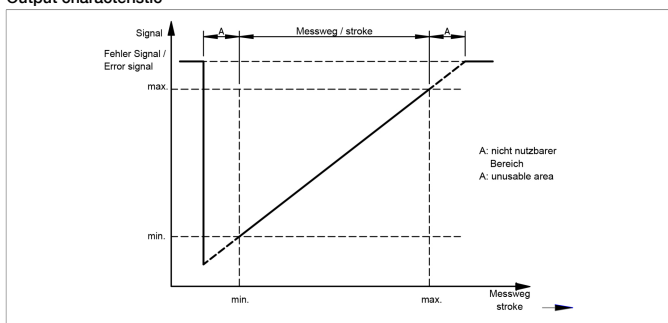
### Connection Assignment

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

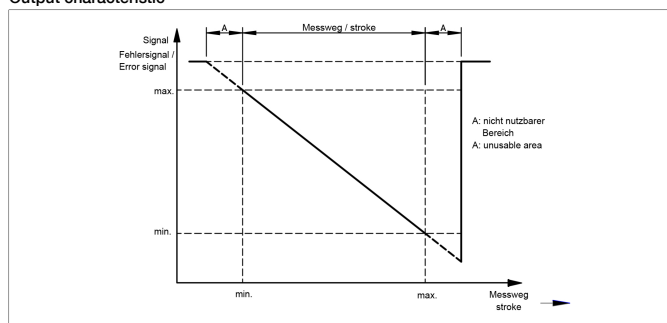


**Technical Data  
Output  
Characteristics**

Output characteristic

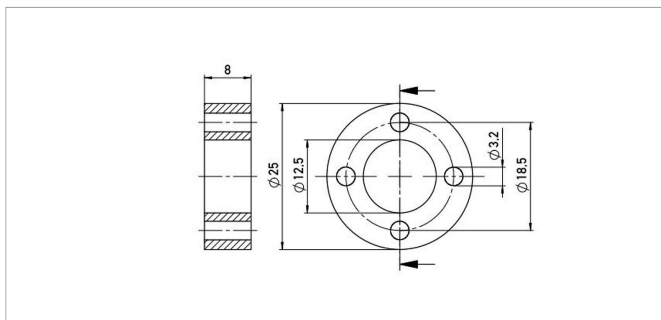
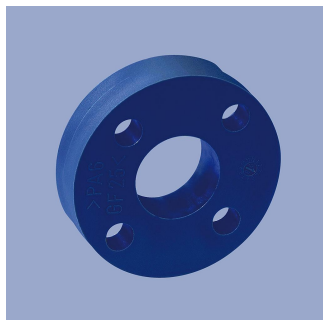


Output characteristic





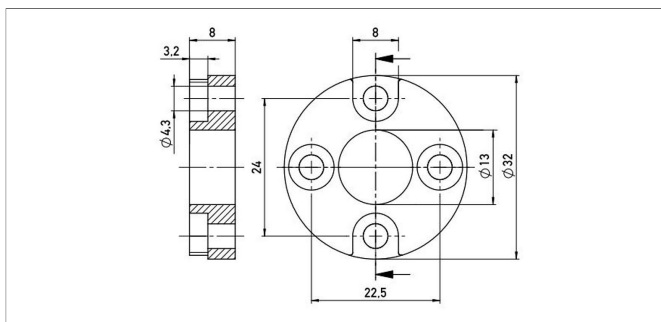
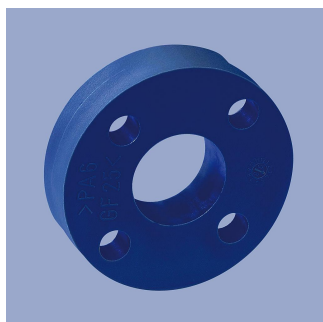
## Position Markers



### 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/mm<sup>2</sup>  
 Fastening torque max. 100 Ncm  
 of mounting

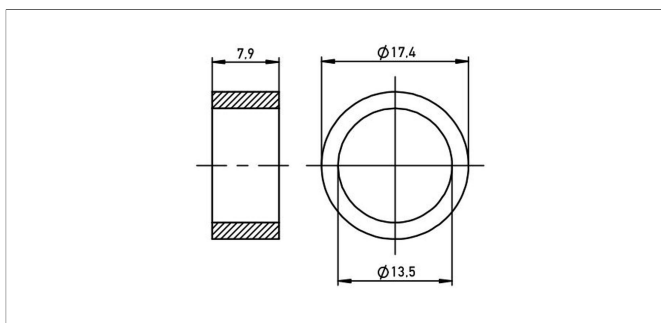
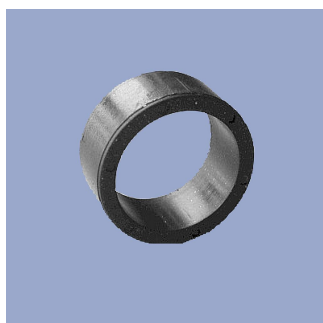
P/N	Pack. unit [pcs]
400005697	1



### Z-TH1-P19

Ring position marker for fixation with screws M4  
 Material PA6-GF  
 Weight approx. 14 g  
 Operating temp. -40 ... +100°C  
 Surface pressure max. 40 N/mm<sup>2</sup>  
 Fastening torque max. 100 Ncm  
 of mounting

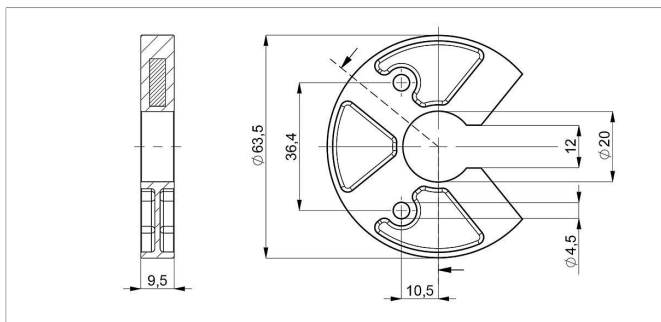
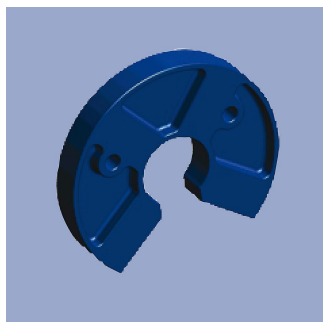
P/N	Pack. unit [pcs]
400005698	1



### Z-TIM-P20

Ring position marker for mounting via lock washer and retaining ring  
 Material PA-Neonbond Compound  
 Weight approx. 5 g  
 Operating temp. -40 ... +100°C  
 Surface pressure max. 10 N/mm<sup>2</sup>

P/N	Pack. unit [pcs]
400005699	1



### Z-TH1-P25

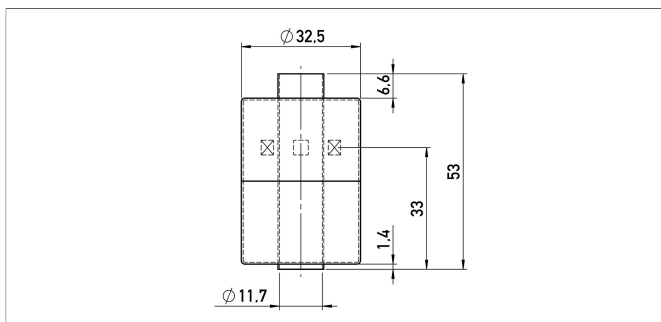
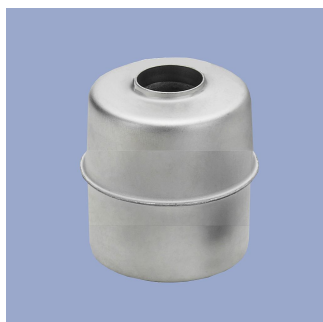
U-shaped position marker for fixation with M4 screws

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/mm<sup>2</sup>  
 Fastening torque max. 100 Ncm  
 of mounting

P/N	Pack. unit [pcs]
400105076	1

## Position Markers



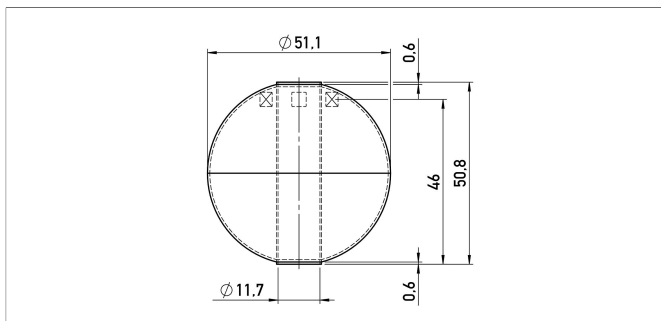
### Z-TH1-P31

Cylinder floating position marker  
Material Stainless steel 1.4404  
Weight approx. 20 g  
Operating temp. -40 ... +100°C  
Compression strength  $\leq 24$  bar  
Density 740 kg/m<sup>3</sup>  
Immersion depth in water approx. 26.6 mm

P/N	Pack. unit [pcs]
400105704	1

400105704

1



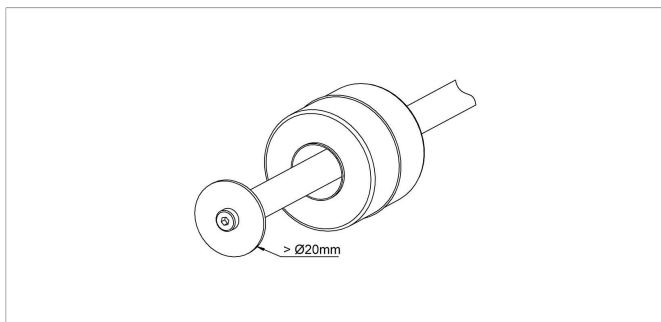
### Z-TH1-P32

Ball-type floating position marker  
Material Stainless steel 1.4571  
Weight approx. 42 g  
Operating temp. -40 ... +100°C  
Compression strength  $\leq 40$  bar  
Density 720 kg/m<sup>3</sup>  
Immersion depth in water 36.7 mm

P/N	Pack. unit [pcs]
400105703	1

400105703

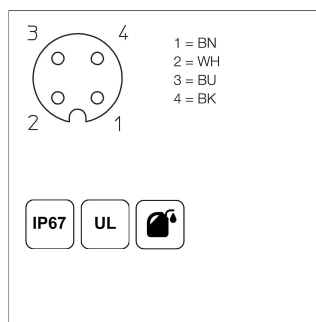
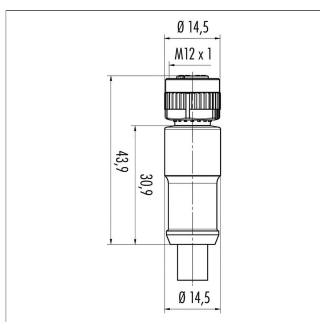
1



When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end.

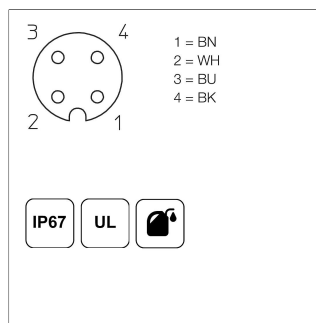
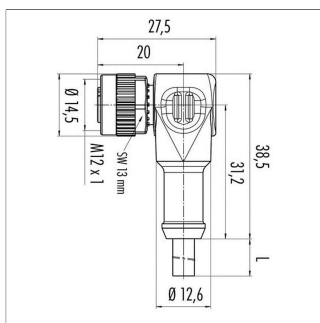
For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).

## 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 mm<sup>2</sup>

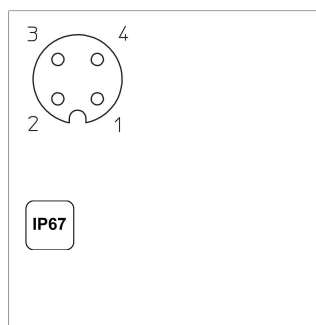
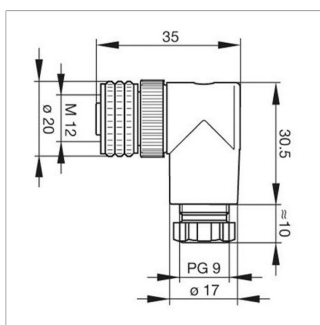
P/N	Type	Length
400056135	EEM-33-35	2 m
400056136	EEM-33-36	5 m
400056137	EEM-33-37	10 m



**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 mm<sup>2</sup>

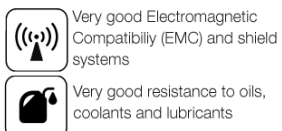
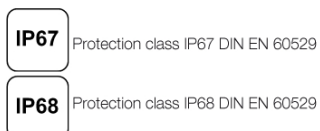
P/N	Type	Length
400056138	EEM-33-38	2 m
400056139	EEM-33-39	5 m
400056140	EEM-33-40	10 m



**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 mm<sup>2</sup>

P/N	Type
400005634	EEM-33-89



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