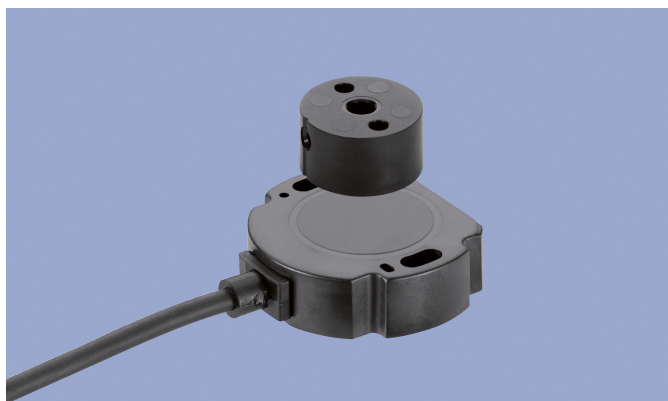


**NOVOHALL  
Rotary Sensor  
Touchless**

**RFC-4800  
Ratiometric  
Mobile Applications**



**Special Features**

- Touchless hall technology
- Electrical range up to 360°
- 2 part design, mechanically decoupled
- High protection class IP67, IP68, IP69
- Resolution up to 12 bit
- Wear-free
- Temperature range -40 °C to +105 °C
- One and multi-channel versions
- Optimized for use in mobile applications with highest EMC requirements such as ISO pulses and high interferences to ISO 11452 and ECE-Standard
- Suitable for safety-related applications according to DIN EN ISO 13849
- Other configurations see separate data sheets

**Applications**

- Mobile working machines (industrial trucks, construction machinery, agricultural and forestry machinery)
- Marine applications

The 2 part design consisting of sensor and magnetic position marker offers great flexibility when mounting. The absence of shaft and bearing makes the assembly much less sensitive to axial and radial application tolerances - separate couplings are obsolete. Measurements can be made transmissively through any non-ferromagnetic material.

With its completely encapsulated electronics the sensor is perfectly suited for use in harsh environments.

Single and multi-channel versions are available and suitable for use in safety-related applications.

**Description**

Material	Housing: high grade, temperature resistant plastic
Mounting	With 2 pan head screws M4x20 (included in delivery)
Fastening torque of mounting	250 Ncm
Electrical connection	Cable 4x 0.5 mm <sup>2</sup> (AWG 20), TPE, unshielded / Connector M12x1 or AMP Superseal with cable L = 0.15 m / Lead wires 0.5 mm <sup>2</sup> (AWG 20), PVC

**Mechanical Data**

Dimensions	See dimension drawing
Mechanical travel	continuous
Weight (w/o connection)	approx. 50 g

## Ordering Specifications

### Ordering Specifications

Preferred types printed in bold

- Delivery time up to 25 pcs. within 10 working days EXW
- Best low-volume pricing

#### Supply voltage Ub

2: Ub = 5 VDC

#### Output signal

1: 5 ... 95% ratiometric to supply voltage Ub (0.25 ... 4.75 VDC)

2: 10 ... 90% ratiometric to supply voltage Ub (0.5 ... 4.5 VDC)

#### Output characteristic

1: Rising characteristic cw

2: Rising characteristic ccw

3: Crossed outputs, channel 1 rising cw (partly redundant)

4: Crossed outputs, channel 1 rising cw (fully redundant)

Other output characteristics on request

#### Electrical connection

##### One-channel /partly redundant version

251: Cable, 4-pole, unshielded, L = 0.5 m

252: Cable, 4-pole, unshielded, L = 1 m

256: Cable, 4-pole, unshielded, L = 3 m

260: Cable, 4-pole, unshielded, L = 5 m

270: Cable, 4-pole, unshielded, L = 10 m

401: Lead wires, 3x L = 0.5 m (single)

411: Lead wires, 4x L = 0.5 m (partly redundant)

551: Connector M12x1, 4-pin, with cable L = 0.15 m, unshielded

552: Connector AMP Superseal, 4-pin, with cable L = 0.15 m, unshielded

##### Fully redundant version

421: Lead wires, 6x L = 0.5 m

Cable versions and assembled connectors on request

**R F C - 4 8 5 1 - 6 3 6 - 2 1 1 - 4 0 1**

Series

#### Mechanical version

4851: Elongated hole mounting for easy adjustment

4852: Round hole mounting

4853: Elongated hole mounting, without diagnostic function

4854: Round hole mounting, without diagnostic function

Other configurations e.g. with internal shielding against magnetic fields on request

#### Measuring range

03: Angle 0° ... 30° min.

...

06, 12, 18, 24, 36

...

36: Angle 0° ... 360° max.

Other angles on request

#### Number of channels

6: One-channel version (1x supply voltage Ub, 1x output)

7: Partly redundant version (1x supply voltage Ub, 2x output)

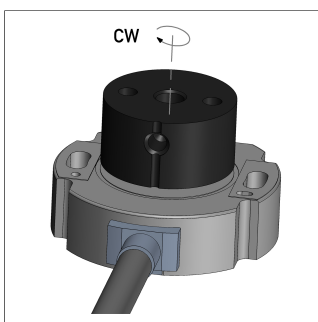
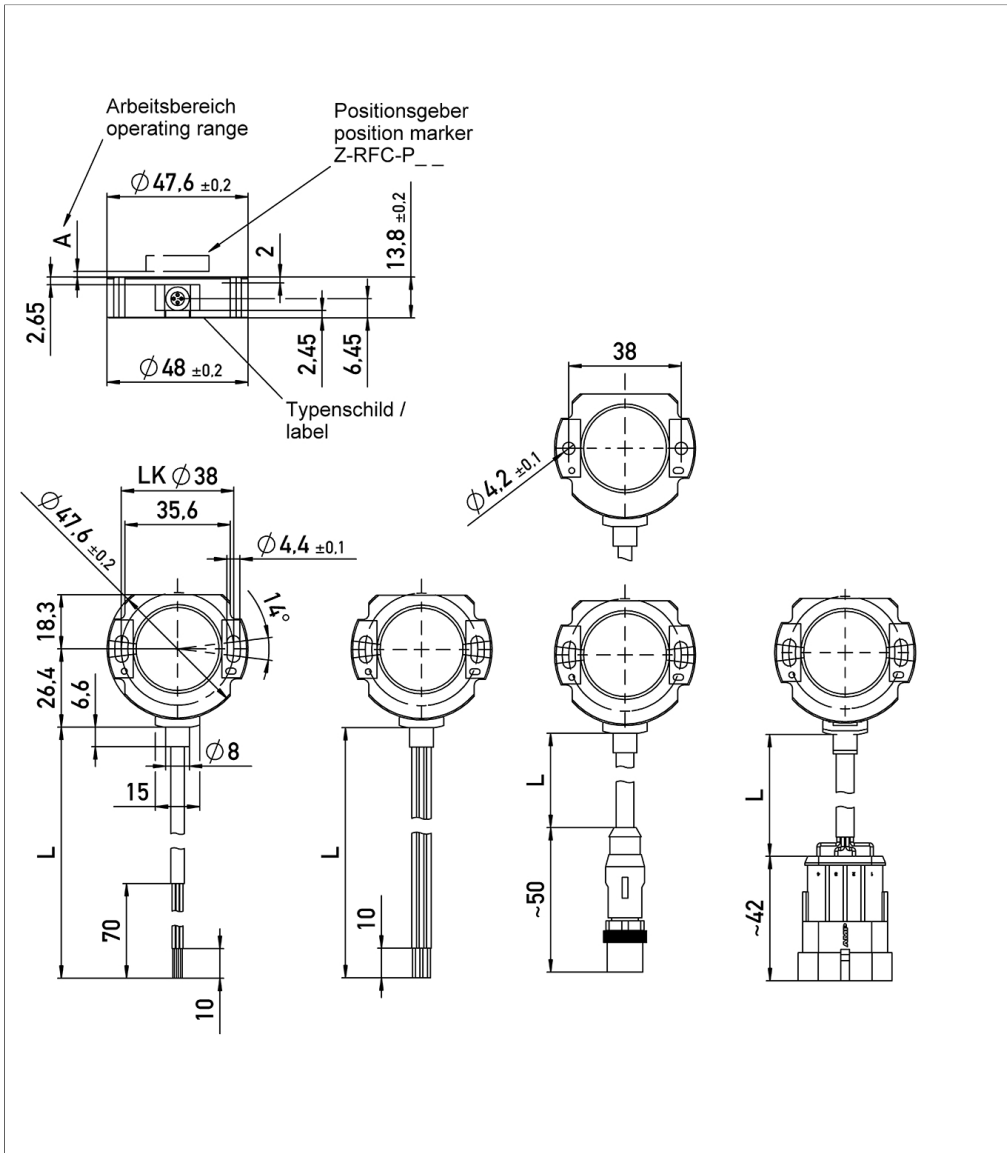
8: Fully redundant version (2x supply voltage Ub, 2x output)

### Accessories included in delivery

- 2x Pan head screws M4x20

**Drawing**

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



When the marking of the position marker is pointing towards the cable, the sensor output is near the electrical center position.

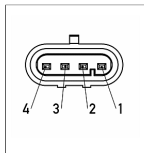
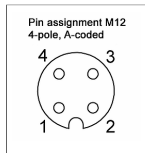
## Technical Data

<b>Type</b>	<b>RFC-48</b> _ _ _ _ _ <b>-2</b> _ _ _ _ _ <b>Ratiometric</b>
Output signal	ratiometric to supply voltage $U_b$ 5 ... 95% (0.25 ... 4.75 V) 10 ... 90% (0.5 ... 4.5 V)
Load	$\geq 5 \text{ k}\Omega$
Number of channels	1 / 2
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Update rate	typ. 3.4 kHz
Measuring range	0 ... 30° up to 0 ... 360° in 10°-steps
Independent linearity	$\leq \pm 0.5 \text{ \%FS}$
Resolution	12 bits
Repeatability	typ. $\leq \pm 0.1^\circ$
Hysteresis	typ. $< \pm 0.1^\circ$ Only measuring range 360°: typ. $< 0.25^\circ$ (lower hysteresis on request)
Temperature error	Measuring range 30 ... 170°: typ. $\pm 0.7 \text{ \%FS}$ , Measuring range $\geq 180^\circ$ : typ. $\pm 0.35 \text{ \%FS}$
Supply voltage $U_b$	5 VDC (4.5 ... 5.5 VDC)
Current consumption w/o load	typ. 12 mA per channel
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (vs. GND and supply voltage $U_b$ )
Insulation resistance (500 VDC)	$\geq 10 \text{ M}\Omega$
<b>Environmental Data</b>	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 5 ... 2000 Hz, $A_{max} = 0.75 \text{ mm}$
Shock IEC 60068-2-27	50 g, 6 ms
Protection class DIN EN 60529	IP67 / IP68 / IP69, IP67 (connector M12)
Operating temperature	-40 ... +105°C, -40 ... +85°C (connector M12)
Life	Mechanically unlimited
Functional safety	Suitable for safety-related applications according to ISO 13849 after customer validation. Further safety data (DCavg...) and support for functional safety are available on request.
MTTF (IEC 60050)	1652 years (one-channel), 824 years (partly redundant, per channel) or 826 years (fully redundant, per channel)
MTTFd (EN ISO 13849-1 parts count method, w/o load)	3304 years (one-channel), 1648 years (partly redundant, per channel) or 1653 years (fully redundant, per channel)
MTTFd-certificate	<a href="https://www.novotechnik.de/en/downloads/certificates/mttf-certificates/">https://www.novotechnik.de/en/downloads/certificates/mttf-certificates/</a>
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
Conformity/Approval	CE, UKCA, E1 see <a href="https://www.novotechnik.de/en/downloads/certificates/declarations-of-conformity-eu/uk">https://www.novotechnik.de/en/downloads/certificates/declarations-of-conformity-eu/uk</a> WEEE see <a href="https://www.novotechnik.de/en/downloads/certificates/eu-directive-weee/">https://www.novotechnik.de/en/downloads/certificates/eu-directive-weee/</a>
<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
EN 13309 Construction machinery	
Emission/Immunity E1	acc. to ECE-R10
ISO 13766-1/-2 Construction machinery	On request

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

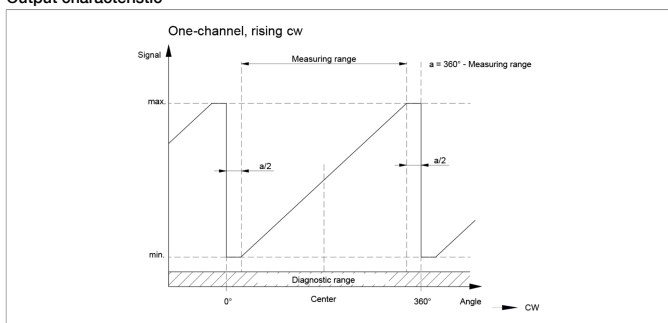
**Connection Assignment**

Signal	Cable code 2__	Connector code 5__	Lead wires code 4__	Cable code 2__	Connector code 5__	Lead wires code 4__	Lead wires code 4__
	One-channel	One-channel	One-channel	Partly redundant	Partly redundant	Partly redundant	Fully redundant
Supply voltage Ub 1	GN	Pin 1	RD	GN	Pin 1	RD	RD
GND 1	BN	Pin 3	BK	BN	Pin 3	BK	BK
Signal output	WH	Pin 2	BU	WH	Pin 2	BU	BU
Signal output 2	-	-	-	YE	Pin 4	BU/WH	BU/WH
Supply voltage Ub 2	-	-	-	-	-	-	RD/WH
GND 2	-	-	-	-	-	-	BK/WH
Not assigned	YE	Pin 4	-	-	-	-	-

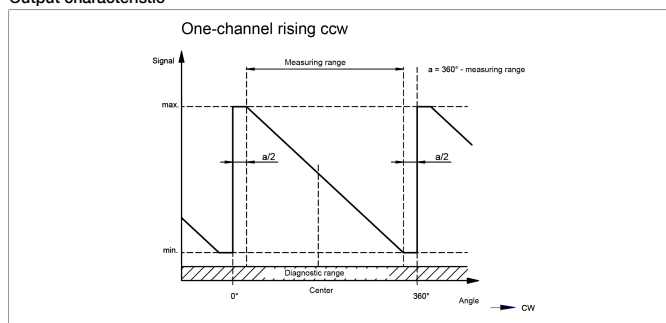


**Technical Data  
Output  
Characteristics**

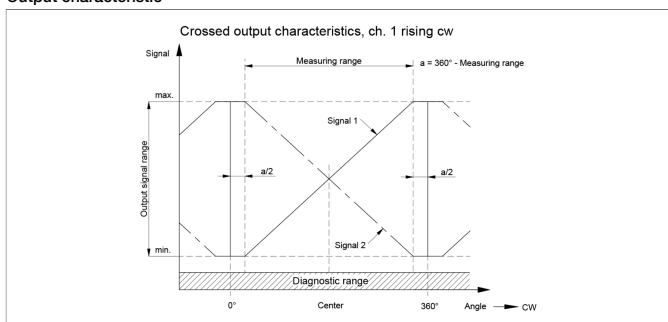
Output characteristic



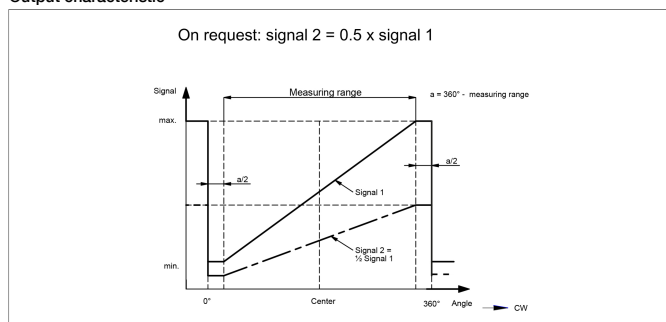
Output characteristic



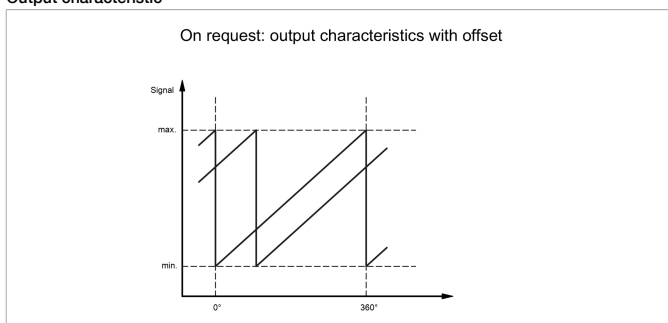
Output characteristic



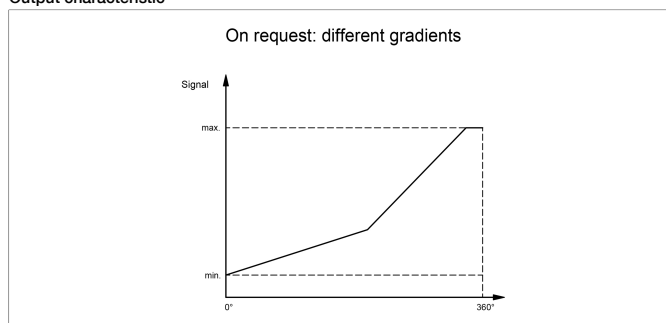
Output characteristic



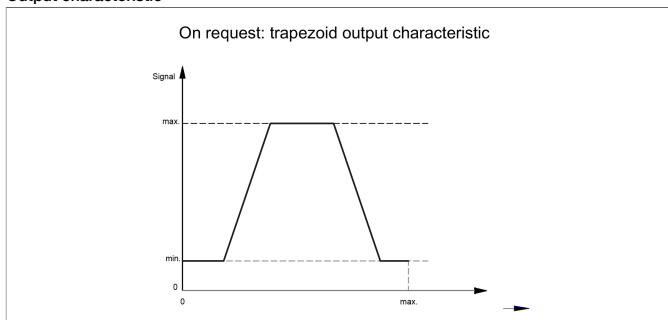
Output characteristic



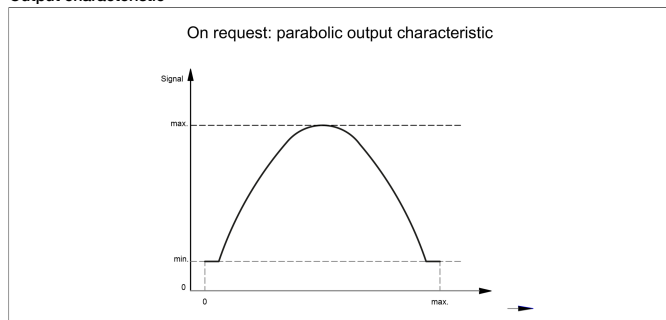
Output characteristic



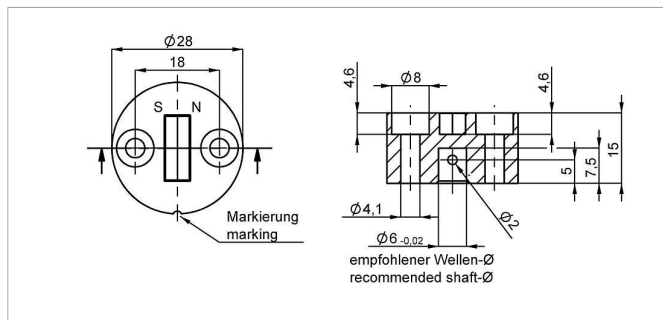
Output characteristic



Output characteristic



## Position Markers

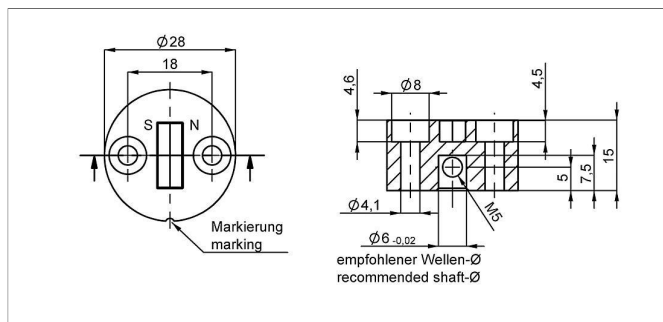


### Z-RFC-P02

Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock) or with locking pin (both included in delivery).

Material PF  
Max. permitted  $\pm 3$  mm  
radial offset  
Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
40005661	1
400056080	25

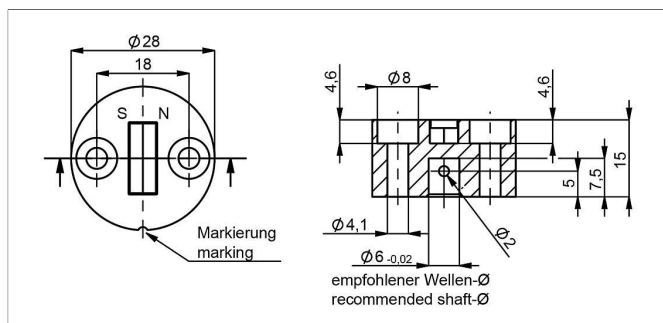


### Z-RFC-P08

Position marker for fixation with threaded pin M5 (included in delivery).

Material PF  
Max. permitted  $\pm 3$  mm  
radial offset  
Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
400056070	1
400056084	25

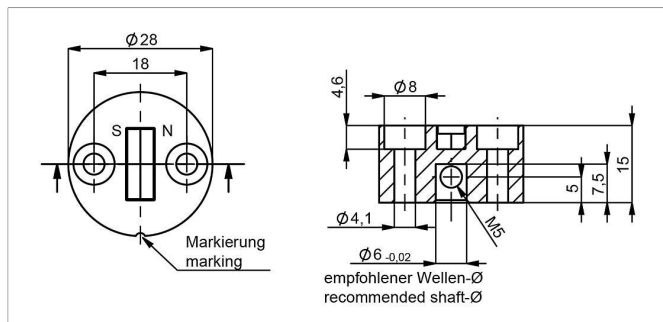


### Z-RFC-P41

Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock) or with locking pin (both included in delivery).

Material PF  
Max. permitted  $\pm 3$  mm  
radial offset  
Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
400105037	1
400105038	25



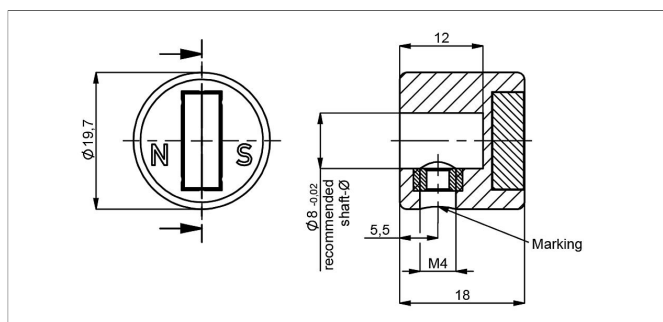
### Z-RFC-P47

Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock) or with threaded pin M5 (both included in delivery).

Material PF  
Max. permitted  $\pm 3$  mm  
radial offset  
Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
400105039	1
400105040	25

## Position Markers



### Z-RFC-P23

Position marker for fixation with threaded pin M4 (included in delivery)

Caution: For orientation of the output characteristic please follow the user manual of the position marker!

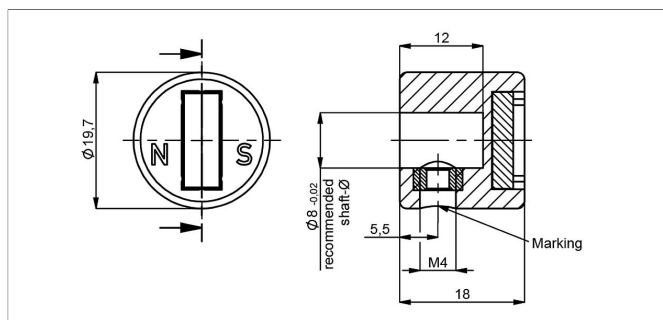
Material PA6-GF

Max. permitted  $\pm 3$  mm

radial offset

Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
400056074	1
400056085	25



### Z-RFC-P43

Position marker for fixation with threaded pin M4 (included in delivery)

Caution: For orientation of the output characteristic please follow the user manual of the position marker!

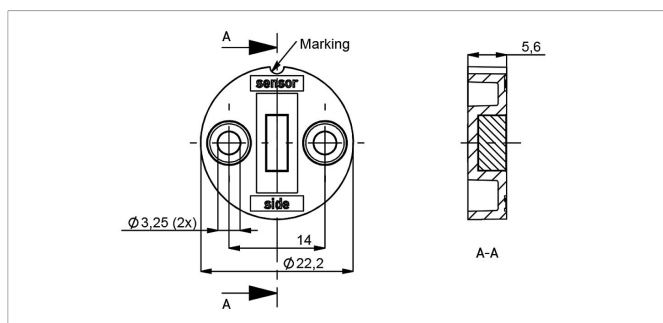
Material PA6-GF

Max. permitted  $\pm 3$  mm

radial offset

Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
400105041	1
400105042	25



### Z-RFC-P30

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

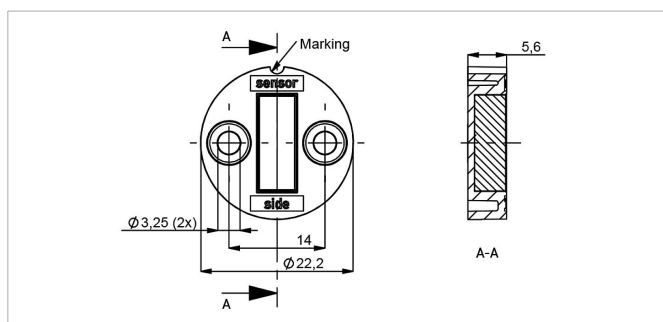
Material PBT-GF

Max. permitted  $\pm 1.5$  mm

radial offset

Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
400056086	1
400056087	25



### Z-RFC-P31

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

Material PBT-GF

Max. permitted  $\pm 3$  mm

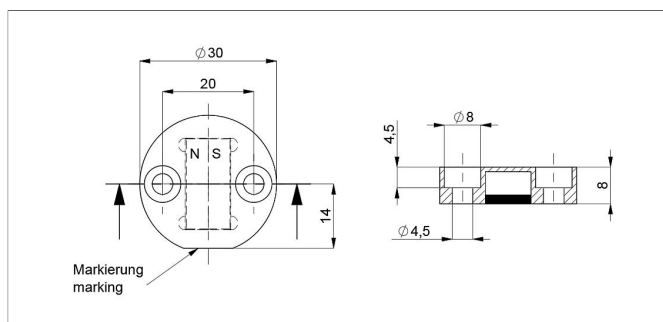
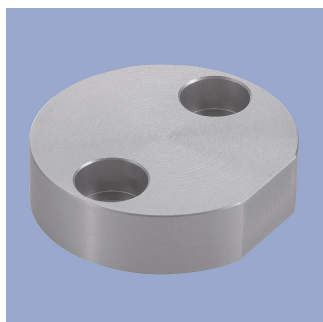
radial offset

Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
400056088	1
400056089	25



## Position Markers



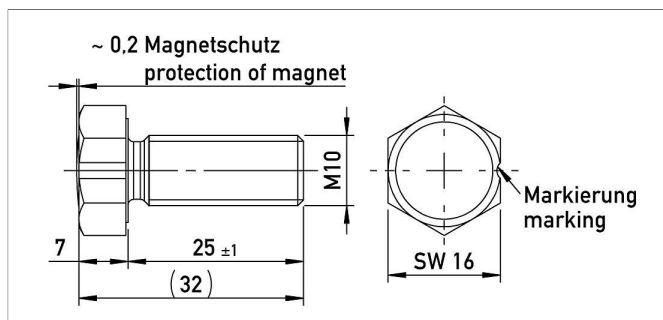
### Z-RFC-P22

Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock, included in delivery).

Attention: Closed side of position marker faces the active side of sensor.

Material Aluminium, anodized  
Max. permitted radial offset  $\pm 4$  mm  
Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
400106735	1
400106736	25

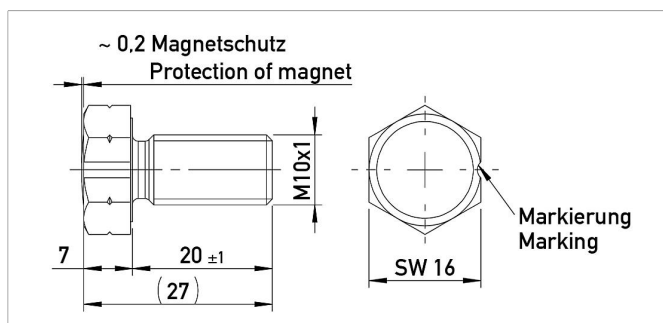


### Z-RFC-P18

Screw position marker M10 x 25 mm, similar DIN 933, magnet potted

Material Aluminium, anodized  
Max. permitted radial offset  $\pm 3$  mm  
Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
400104756	1
400104757	25

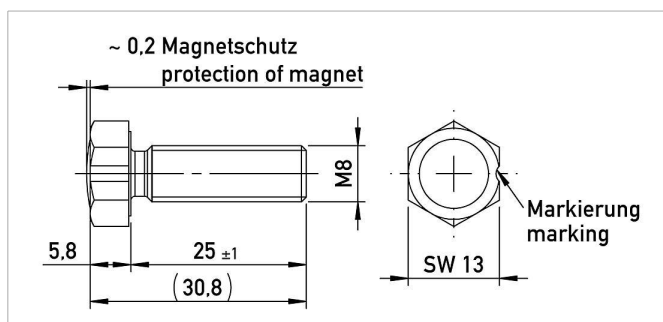


### Z-RFC-P28

Screw position marker M10x1 x 20 mm, similar DIN 933, magnet potted

Material Aluminium, anodized  
Max. permitted radial offset  $\pm 3$  mm  
Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
400108462	1
400108463	25



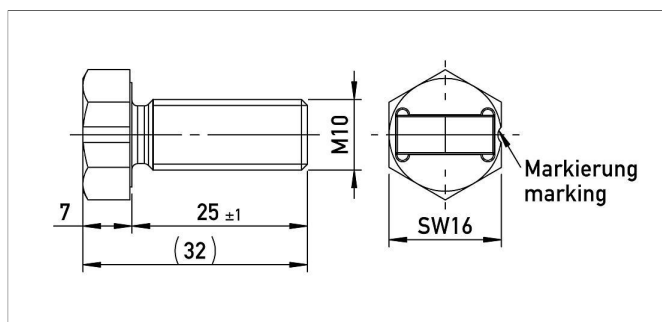
### Z-RFC-P19

Screw position marker M8 x 25 mm, similar DIN 933/ISO 4017, magnet potted

Material Aluminium, anodized  
Max. permitted radial offset  $\pm 1.5$  mm  
Operating temp.  $-40 \dots +125^\circ\text{C}$

P/N	Pack. unit [pcs]
400104754	1
400104755	25

## Position Markers



### Z-RFC-P20

Screw position marker M10 x 25 mm, similar DIN 933

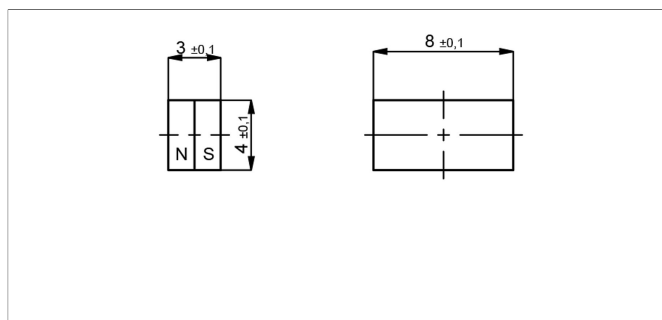
Material Aluminium, anodized

Max. permitted radial offset ± 3 mm

Operating temp. -40 ... +125°C

P/N Pack. unit [pcs]

400104758	1
400104759	25



### Z-RFC-P03

Magnet for direct application onto customer's shaft (see user manual).

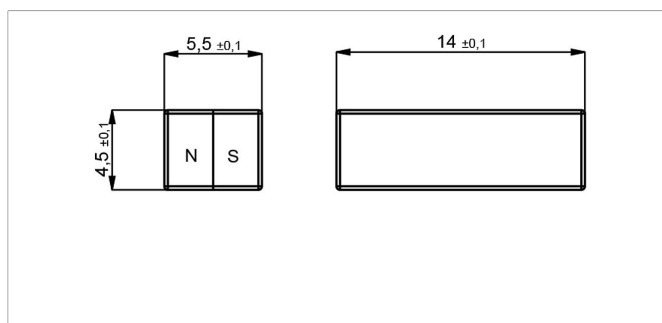
We recommend mounting on non-magnetizable materials, otherwise the specified working distances will vary (e.g. reduction of approx. 20% with axial mounting on a magnetizable shaft).

Max. permitted radial offset ± 1.5 mm

Operating temp. -40 ... +125°C

P/N Pack. unit [pcs]

400005658	1
400056081	50



### Z-RFC-P04

Magnet for direct application onto customer's shaft (see user manual).

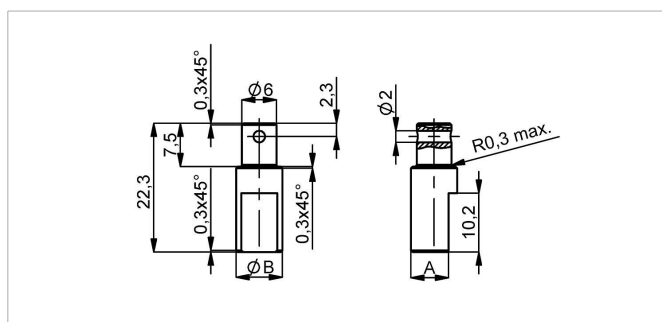
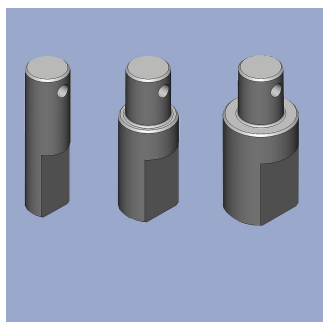
We recommend mounting on non-magnetizable materials, otherwise the specified working distances will vary (e.g. reduction of approx. 20% with axial mounting on a magnetizable shaft).

Max. permitted radial offset ± 3 mm

Operating temp. -40 ... +125°C

P/N Pack. unit [pcs]

400005659	1
400056082	50



### Z-RFC-S01/S02/S03

Shaft adapter for fixation at position marker Z-RFC-P02/P41 with locking pin

Material Stainless steel 1.4305

P/N Type ØB / A [mm]

400056206	Z-RFC-S01	6 / 4.5
400056207	Z-RFC-S02	8 / 6.5
400056208	Z-RFC-S03	10 / 8.5

## Position Markers

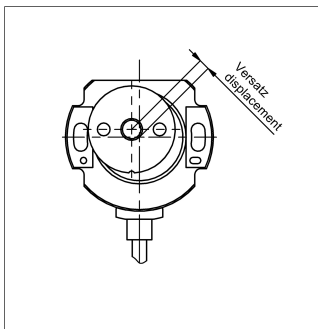
### Working Distances Position Markers [mm] - One-channel Versions

	Z-RFC-P02 / P04 / P08 Z-RFC-P20 / P23 / P31	Z-RFC-P41 / P43 / P47	Z-RFC-P03 / P30	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P22
RFC-4851	2.3 ... 5	0 ... 2.7	0.7 ... 2.2	0 ... 4.5	0 ... 2.2	4.4 ... 9.2
RFC-4852 with diagnosis						
RFC-4853	0 ... 4	0 ... 2.7	0 ... 1.5	0 ... 4.5	0 ... 2.2	4.4 ... 9.2
RFC-4854 w/o diagnosis						

### Working Distances Position Markers [mm] - Redundant Versions

	Z-RFC-P02 / P04 / P08 Z-RFC-P20 / P23 / P31	Z-RFC-P41 / P43 / P47	Z-RFC-P03 / P30	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P22
RFC-4851	1.9 ... 4.5	0 ... 2.3	0.3... 1.8	0 ... 4	0 ... 1.7	4 ... 8.8
RFC-4852 with diagnosis						
RFC-4853	0 ... 4	0 ... 2.3	0... 1.5	0 ... 4	0 ... 1.7	4 ... 8.8
RFC-4854 w/o diagnosis						

### Lateral Magnet Offset



Lateral magnet offset will cause additional linearity error. The angle error, which is caused by radial displacement of sensor and position marker depends on the used position marker or magnet.

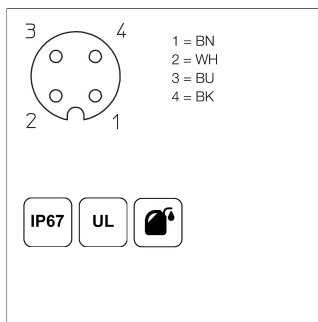
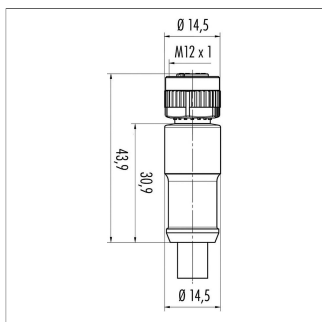
### Additional Linearity Error at Radial Displacement - One-channel Versions

Z-RFC-P02 / P04 / P08 Z-RFC-P20 / P23 / P31	Z-RFC-P41 / P43 / P47	Z-RFC-P03 / P30	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P22
0.5 mm: $\pm 0.4^\circ$	0.5 mm: $\pm 0.4^\circ$	0.5 mm: $\pm 1.4^\circ$	0.5 mm: $\pm 0.7^\circ$	0.5 mm: $\pm 1.3^\circ$	1.0 mm: $\pm 0.8^\circ$
1.0 mm: $\pm 1.1^\circ$	1.0 mm: $\pm 1.1^\circ$	1.0 mm: $\pm 3.7^\circ$	1.0 mm: $\pm 1.3^\circ$	1.0 mm: $\pm 2.6^\circ$	2.0 mm: $\pm 1.8^\circ$
2.0 mm: $\pm 3.5^\circ$	2.0 mm: $\pm 3.5^\circ$	2.0 mm: -	2.0 mm: $\pm 3.3^\circ$	2.0 mm: -	4.0 mm: $\pm 5.4^\circ$

### Additional Linearity Error at Radial Displacement - Redundant Versions

Z-RFC-P02 / P04 / P08 Z-RFC-P20 / P23 / P31	Z-RFC-P41 / P43 / P47	Z-RFC-P03 / P30	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P22
0.5 mm: $\pm 0.7^\circ$	0.5 mm: $\pm 0.7^\circ$	0.5 mm: $\pm 2.5^\circ$	0.5 mm: $\pm 1.1^\circ$	0.5 mm: $\pm 2.3^\circ$	1.0 mm: $\pm 1.1^\circ$
1.0 mm: $\pm 1.8^\circ$	1.0 mm: $\pm 1.8^\circ$	1.0 mm: $\pm 6.4^\circ$	1.0 mm: $\pm 2^\circ$	1.0 mm: $\pm 4.5^\circ$	2.0 mm: $\pm 2.4^\circ$
2.0 mm: $\pm 5.2^\circ$	2.0 mm: $\pm 5.2^\circ$	2.0 mm: -	2.0 mm: $\pm 4.6^\circ$	2.0 mm: -	4.0 mm: $\pm 6.7^\circ$

## 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

**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

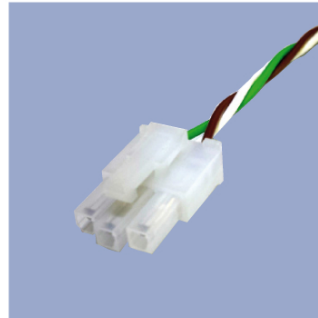
**UL** UL - approved

 CAN-Bus

## 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



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



- Tyco AMP Super Seal**
- Pin- and bushing housing
  - 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



- 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

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