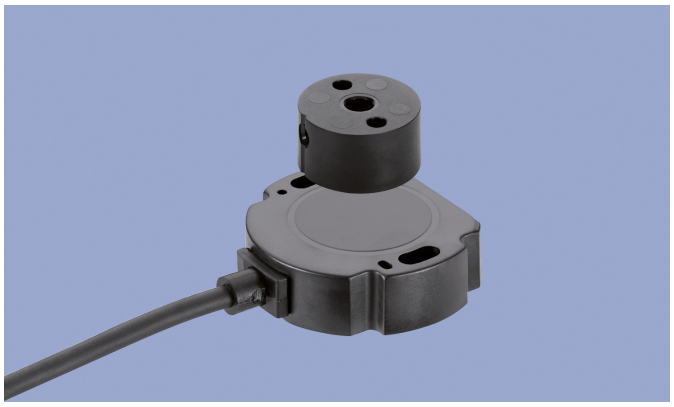
novotechnik
Siedle Group

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 dual-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 mm² (AWG 20), TPE, unshielded / Connector M12x1 or AMP Superseal with cable L = 0.15 m / Lead wires 0.5 mm² (AWG 20), PVC

Mechanical Data

Dimensions	See dimension drawing
Mechanical travel	360° 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
Single-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

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: Single-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)

Series

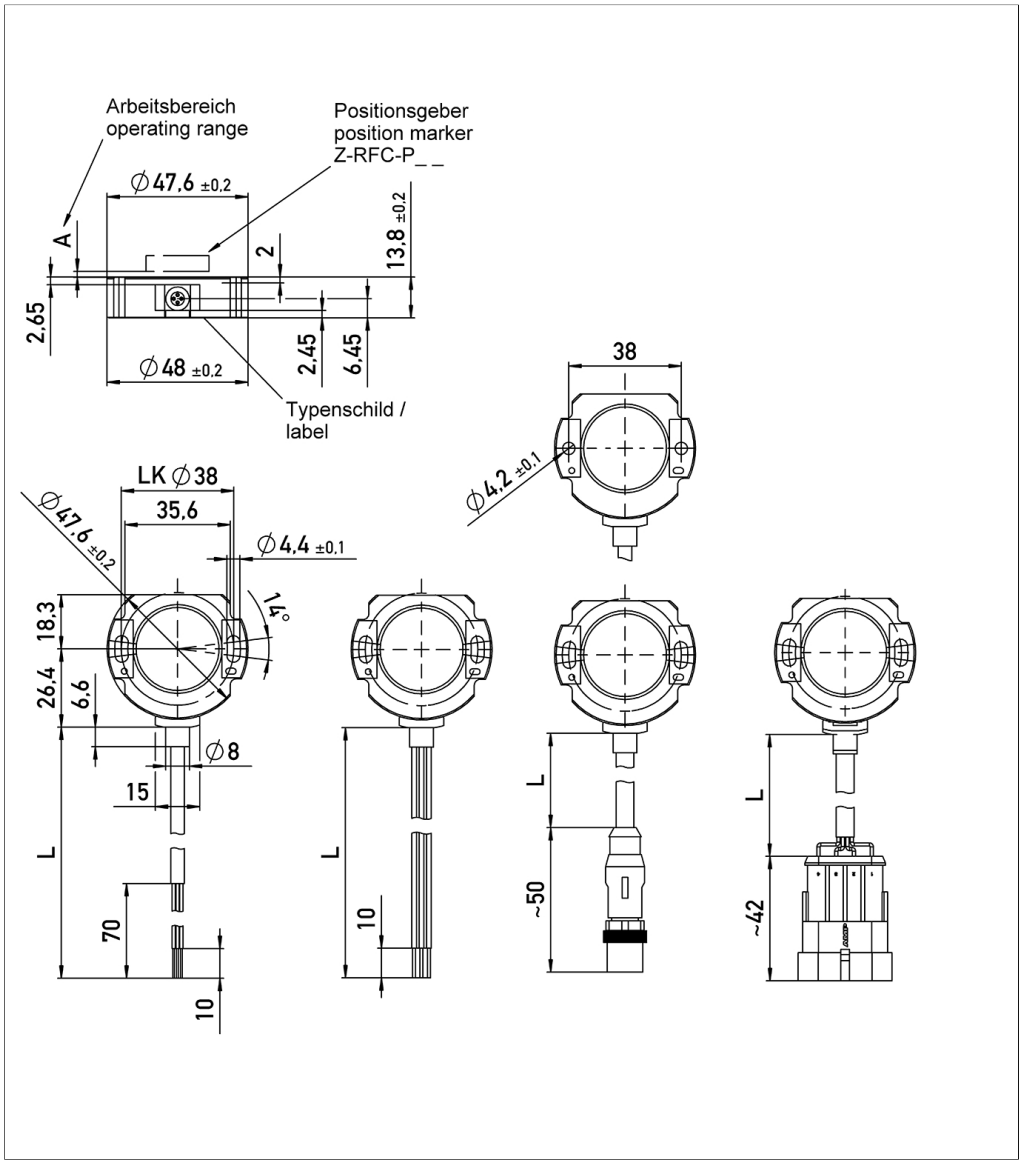
Mechanical version
4851: Elongated hole mounting for easy adjustment
4852: Round hole mounting
4853: Elongated hole mounting, without diagnostic function
4854: Round hole mounting, without diagnostic function
Other configurations e.g. with internal shielding against magnetic fields on request

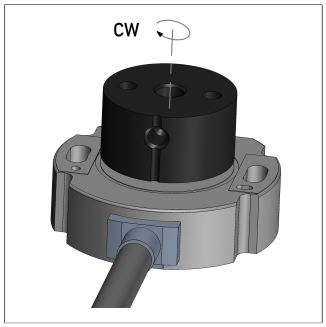
Accessories included in delivery

- 2x Pan head screws M4x20

Drawing

CAD data see
www.novotechnik.de/en/download/cad-data/





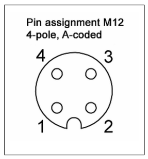
When the marking of the position marker is pointing towards the cable, the sensor output is near the electrical center position.

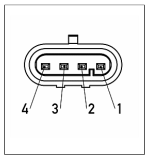
Technical Data

Type	**RFC-48_ _-_ _ _-2_ _-_ _ _** **Ratiometric**
Output signal	ratiometric to supply voltage Ub 5 ... 95% (0.25 ... 4.75 V) 10 ... 90% (0.5 ... 4.5 V)
Load	≥ 5 kΩ
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	≤ ±0.5 %FS
Resolution	12 bits
Repeatability	typ. ≤ ±0.1°
Hysteresis	typ. < ±0.1° Only measuring range 360°: typ. < 0.25° (lower hysteresis on request)
Temperature error	Measuring range 30 ... 170°: typ. ±0.7 %FS, Measuring range ≥ 180°: typ. ±0.35 %FS
Supply voltage Ub	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)
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, 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	https://www.novotechnik.de/en/downloads/certificates/mttfd-certificates/
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 11452-5 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

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_ _
	Single-channel	Single-channel	Single-channel	Partly redundant	Partly redundant	Partly redundant	Fully redundant
Supply voltage Ub	GN	Pin 1	RD	GN	Pin 1	RD	RD
GND	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	-	-	-	-	-

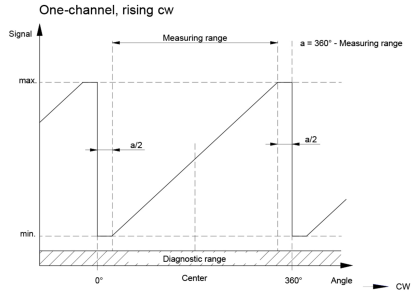




Technical Data
Output Characteristics

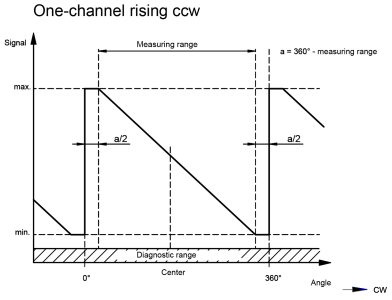
Output characteristic

One-channel, rising cw



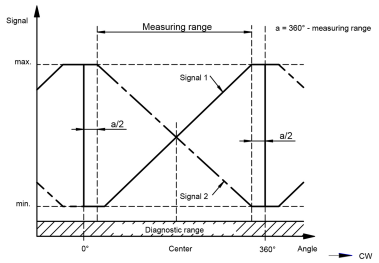
Output characteristic

One-channel rising ccw



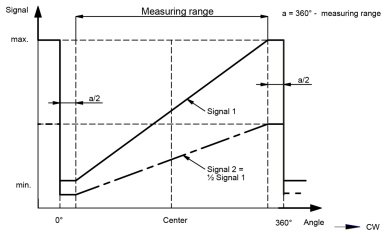
Output characteristic

Crossed output characteristics, ch. 1 rising cw



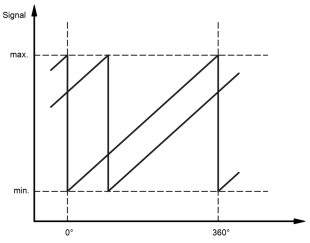
Output characteristic

On request: signal 2 = 0.5 x signal 1



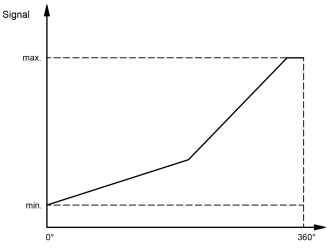
Output characteristic

On request: output characteristics with offset



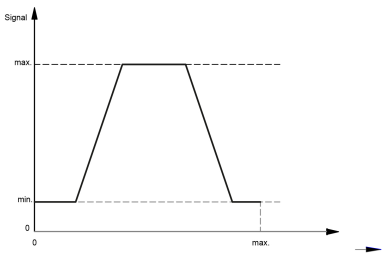
Output characteristic

On request: different gradients



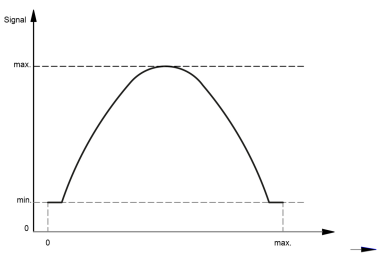
Output characteristic

On request: trapezoid output characteristic

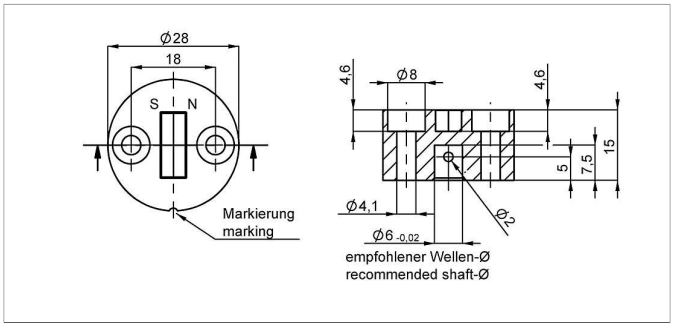


Output characteristic

On request: parabolic output characteristic



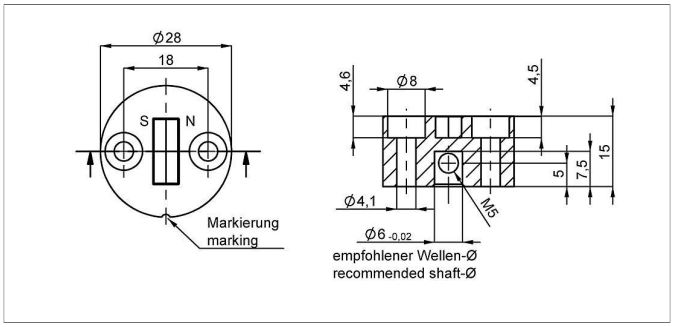
Position Markers



Z-RFC-P02
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with microencapsulation) or with locking pin (both included in delivery).

Material	PF
Max. permitted radial offset	± 3 mm

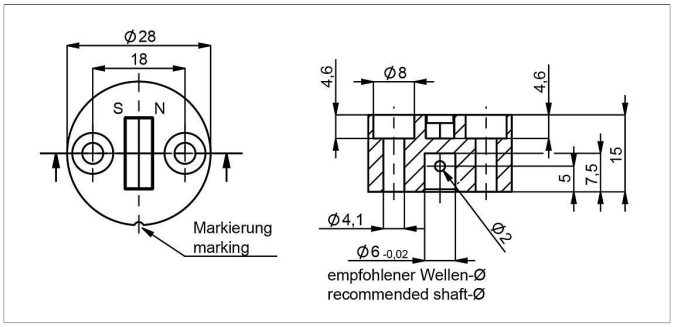
P/N	Pack. unit [pcs]
400005661	1
400056080	25



Z-RFC-P08
Position marker for fixation with threaded pin M5 (included in delivery).

Material	PF
Max. permitted radial offset	± 3 mm

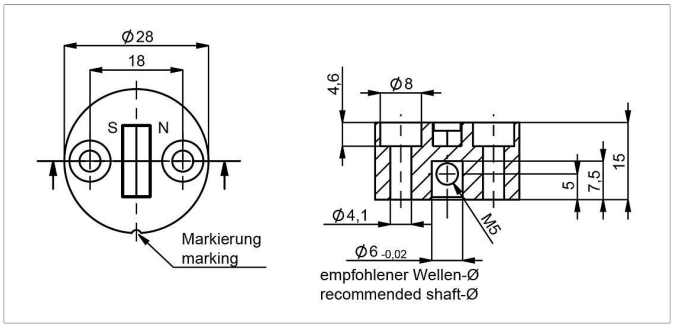
P/N	Pack. unit [pcs]
400056070	1
400056084	25



Z-RFC-P41
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with microencapsulation) or with locking pin (both included in delivery).

Material	PF
Max. permitted radial offset	± 3 mm

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

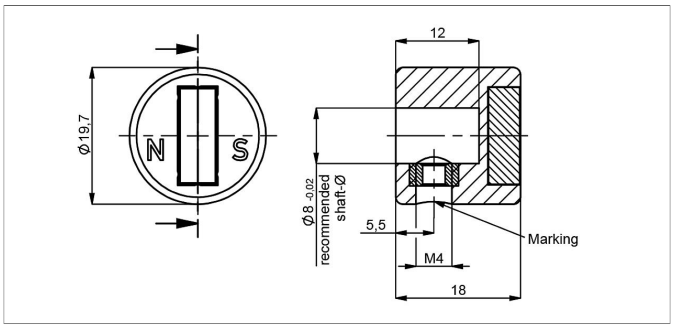


Z-RFC-P47
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with microencapsulation) or with threaded pin M5 (both included in delivery).

Material	PF
Max. permitted radial offset	± 3 mm

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

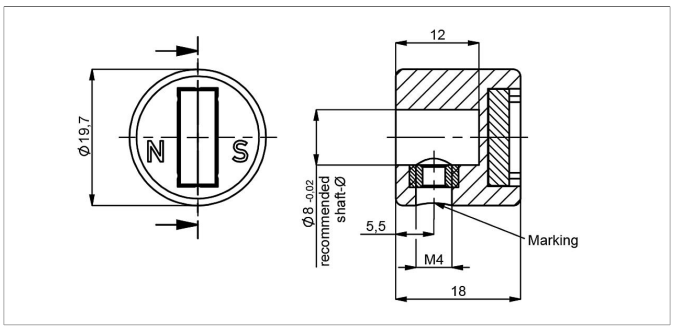
Position Markers



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 radial offset	± 3 mm

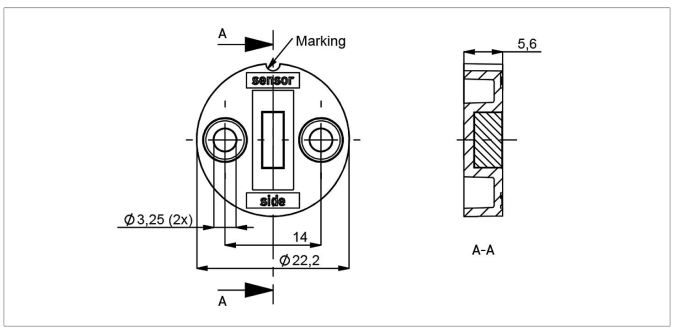
P/N	Pack. unit [pcs]
400056074	1
400056085	25



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 radial offset	± 3 mm

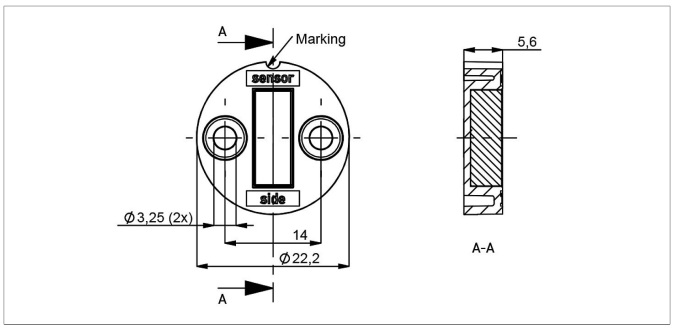
P/N	Pack. unit [pcs]
400105041	1
400105042	25



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

Material	PBT-GF
Max. permitted radial offset	± 1.5 mm

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

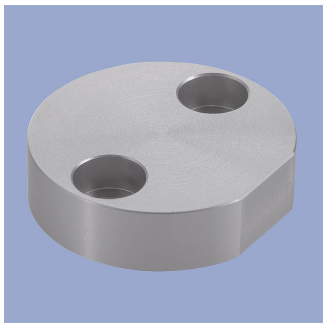


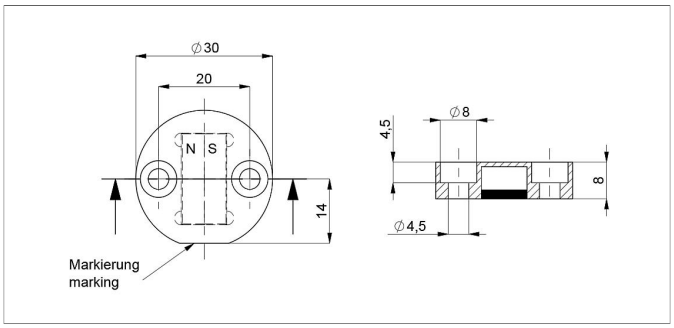
Z-RFC-P31
Position marker for frontal fixation with 2 cylinder screws M3x8 (included in delivery).

Material	PBT-GF
Max. permitted radial offset	± 3 mm

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

Position Markers

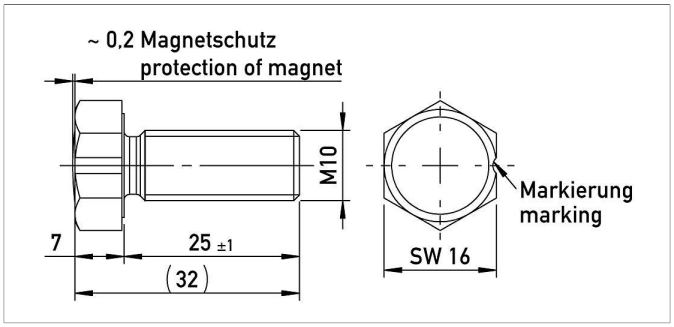




Z-RFC-P22
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with microencapsulation, included in delivery).
Attention: Closed side of position marker faces the active side of sensor.

Material	Aluminium, anodized
Max. permitted radial offset	± 4 mm
Operating temp.	-40 ... +125°C

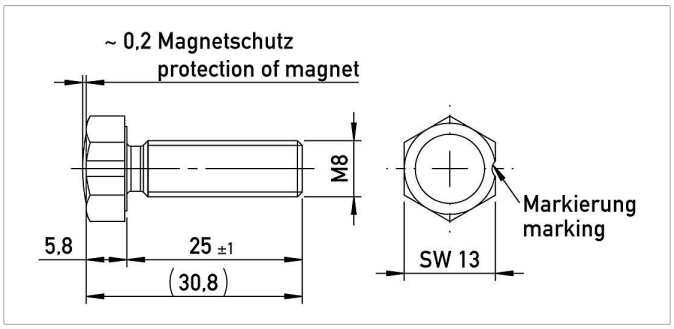
P/N	Pack. unit [pcs]
400106735	1
400106736	25



Z-RFC-P18
Screw position marker M10 x 25 mm, similar DIN 933, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm

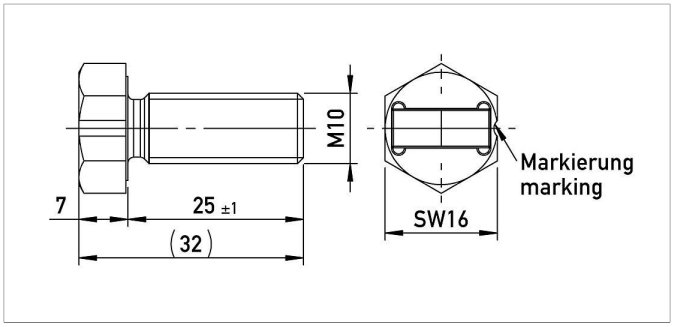
P/N	Pack. unit [pcs]
400104756	1
400104757	25



Z-RFC-P19
Screw position marker M8 x 25 mm, similar DIN 933/ISO 4017, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 1.5 mm

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

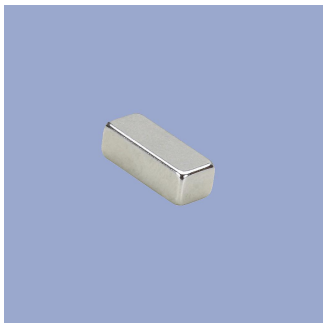


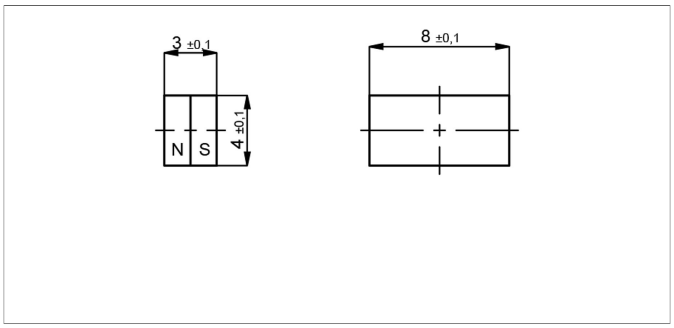
Z-RFC-P20
Screw position marker M10 x 25 mm, similar DIN 933

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm

P/N	Pack. unit [pcs]
400104758	1
400104759	25

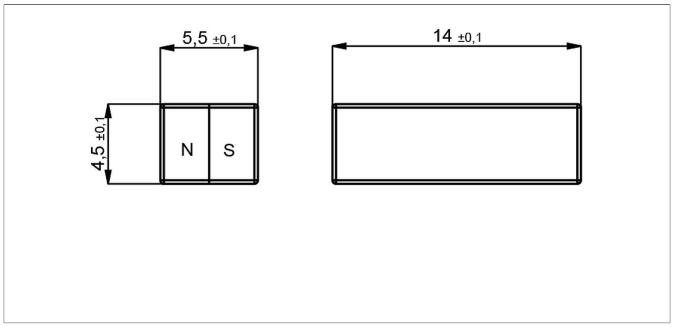
Position Markers





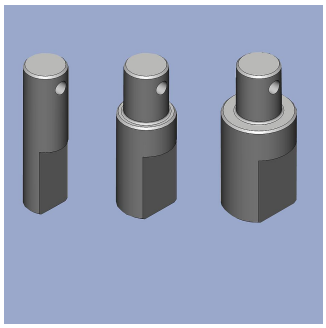
Z-RFC-P03
Magnet for direct application onto customer's shaft (see user manual).
We recommend mounting on non-magnetizable materials, otherwise the specified working distances will vary (e.g. reduction of approx. 20% with axial mounting on a magnetizable shaft).
Max. permitted radial offset ± 1.5 mm

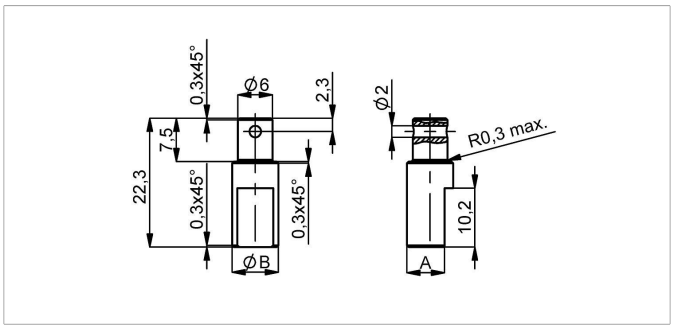
P/N	Pack. unit [pcs]
400005658	1
400056081	50



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

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 SS 1.4305 / AISI 303

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

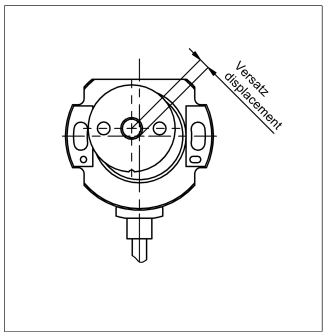
Working Distances Position Markers [mm] - Single-channel Versions

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

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	Z-RFC-P19	Z-RFC-P22
RFC-4851 RFC-4852 with diagnosis	1.9 ... 4.5	0 ... 2.3	0.3... 1.8	0 ... 4	0 ... 1.7	4 ... 8.8
RFC-4853 RFC-4854 w/o diagnosis	0 ... 4	0 ... 2.3	0... 1.5	0 ... 4	0 ... 1.7	4 ... 8.8

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.

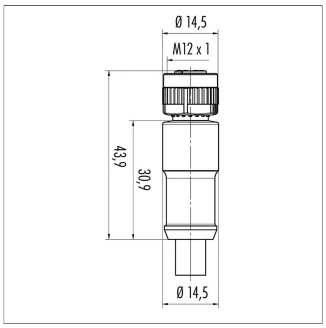
Additional Linearity Error at Radial Displacement - Single-channel Versions

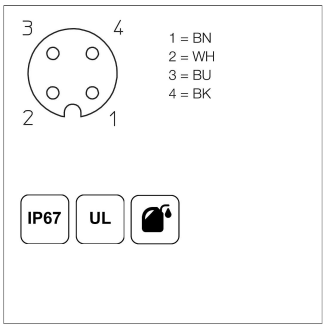
Z-RFC-P02 / P04 / P08 Z-RFC-P20 / P23 / P31	Z-RFC-P41 / P43 / P47	Z-RFC-P03 / P30	Z-RFC-P18	Z-RFC-P19	Z-RFC-P22
0.5 mm: ±0.4°	0.5 mm: ±0.4°	0.5 mm: ±1.4°	0.5 mm: ±0.7°	0.5 mm: ±1.3°	1.0 mm: ±0.8°
1.0 mm: ±1.1°	1.0 mm: ±1.1°	1.0 mm: ±3.7°	1.0 mm: ±1.3°	1.0 mm: ±2.6°	2.0 mm: ±1.8°
2.0 mm: ±3.5°	2.0 mm: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

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	Z-RFC-P19	Z-RFC-P22
0.5 mm: ±0.7°	0.5 mm: ±0.7°	0.5 mm: ±2.5°	0.5 mm: ±1.1°	0.5 mm: ±2.3°	1.0 mm: ±1.1°
1.0 mm: ±1.8°	1.0 mm: ±1.8°	1.0 mm: ±6.4°	1.0 mm: ±2°	1.0 mm: ±4.5°	2.0 mm: ±2.4°
2.0 mm: ±5,2°	2.0 mm: ±5.2°	2.0 mm: -	2.0 mm: ±4.6°	2.0 mm: -	4.0 mm: ±6.7°

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

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

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

Novotechnik U.S., Inc.
155 Northboro Road

Southborough, MA 01772
Phone 508 485 2244
Fax 508 485 2430
info@novotechnik.com
www.novotechnik.com

© Aug 2, 2021

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.