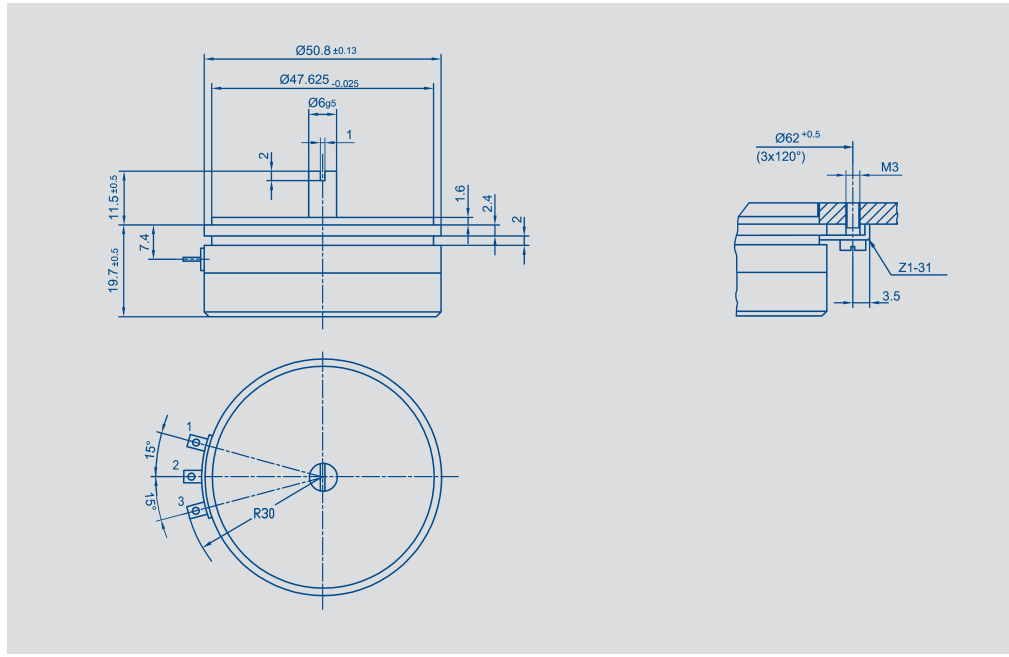
Датчики вращения однооборотные RSA-3200, RFE-3200, P-6500, датчики вращения Multi-turn MC1-2800

Технические характеристики

novotechnik
Siedle Group

Standard Potentiometers

Series P6500



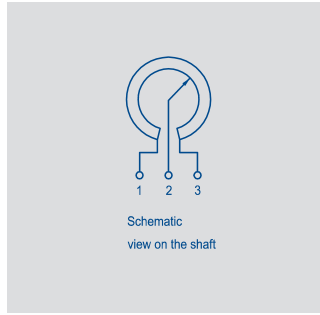
Special features

- very long life - 100 x 10^6 movements
- very good linearity - standard ± 0.05 %,
- very high resolution - better than 0.007°
- high admissible operating speed 10 000 min^{-1}
- unrestricted continuous rotation

Precision potentiometer for measuring, control and instrumentation applications.

The distinguishing features of the P 6500 include an all metal case, ball-bearings, a conductive resistance element and elastomer-damped wipers.
As a high-precision angular displacement transducer this potentiometer meets all kinds of analog applications.
Together with an A/D converter it serves as a low-cost digital-absolute-encoder for precision setting or pick-up and thus opens a multitude of digital applications.

Special versions with different electrical travels and shaft dimensions are available.



Description	
Size	servo size 20
Case	two-part; flange anodized aluminium; cover high-grade, temperature-resistant plastic
Shaft	stainless steel
Bearings	stainless steel ball bearings
Resistance element	conductive plastic
Wiper assembly	precious metal multi-finger wiper
Electrical connections	gold-plated brass terminals

Important
All the values given in this data sheet for linearity, lifetime and temperature coefficient in the voltage dividing mode are quoted for the device operating with the wiper voltage driving on operational amplifier working as a voltage follower, where virtually no load is applied to the wiper ($I_e \leq 1\mu A$).

Mechanical Data		
Dimensions	see drawing	
Mounting	with 3 clamps Z 1 - 31	
Mechanical travel	360, continuous	°
Permitted shaft loading (axial and radial) static or dynamic force	45	N
Torque	≤0,15	Ncm
Maximum operational speed	10 000	min^{-1}
Weight	80	g
Electrical Data		
Actual electrical travel	355 ±2	°
Available resistance values	1; 2; 5	kΩ
Resistance tolerance	±20	%
Repeatability	0.002 (≙0.007°)	%
Effective temperature coefficient of the output-to-applied voltage ratio	typical 5	ppm/K
Independent linearity	±0.05	%
Max. permissible applied voltage	42	V
Recommended operating wiper current	≤ 1	µA
Max. wiper current in case of malfunction	10	mA
Insulation resistance (500 VDC)	≥ 10	MΩ
Dielectric strength (500 VAC, 50 Hz)	≤ 100	µA

Environmental Data		
Temperature range	-40...+100	°C
Vibration	5...2000 A_{max} = 0.75 a_{max} = 20	Hz mm g
Shock	50 11	g ms
Life	>100 x 10^6	rev.
Protection class	IP 40 (DIN 400 50 / IEC 529)	

Order designations		
Type	**Art.no.**	**R in kΩ**
P6501 A102	008201	1
P6501 A202	008202	2
P6501 A502	008203	5

Additional models available		
P6501 S0049	008224	∢ 60°± 2°, indep. Lin. ± 0,2%; R= 1kΩ ±20%
P6501 G252	008221	∢ 90°± 2°, indep. Lin. ± 0,3%; R= 2,5kΩ ±20%
P6501 R252	008225	∢ 180°± 2°, indep. Lin. ± 0,15%; R= 2,5kΩ ±20%

Type designations for non-standard models will be specified upon receipt of order.

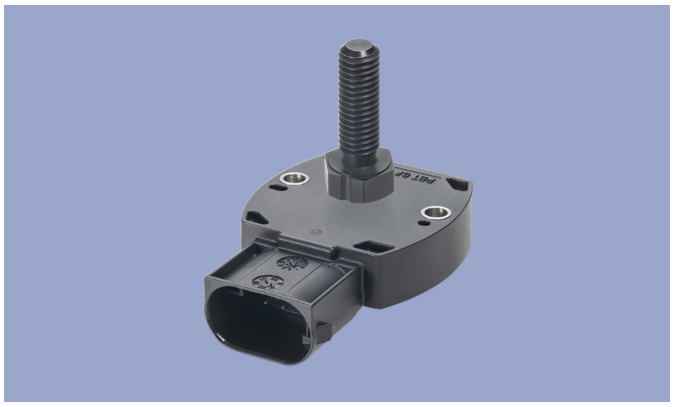
Included in delivery
3 mounting clamps Z1-31

Recommended accessories
Fork coupling Z 104 G 6,
Fork coupling Z 105 G 6 (backlash-free),
Process-controlled indicators MAP... with display,
Signal conditioner MUP... / MUK … for standardized output signals

novotechnik
Siedle Group

NOVOHALL
Rotary Sensor
Touchless

RFE-3200
Mobile Applications



Special Features
- Touchless hall technology
- Electrical range 360°
- 2 part design, mechanically decoupled
- High protection class IP67, IP68, IP69K
- Resolution 14 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, exceeds E1 requirements
- 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.
The sensor is perfectly suitable for use in harsh environmental conditions through the completely encapsulated electronics.

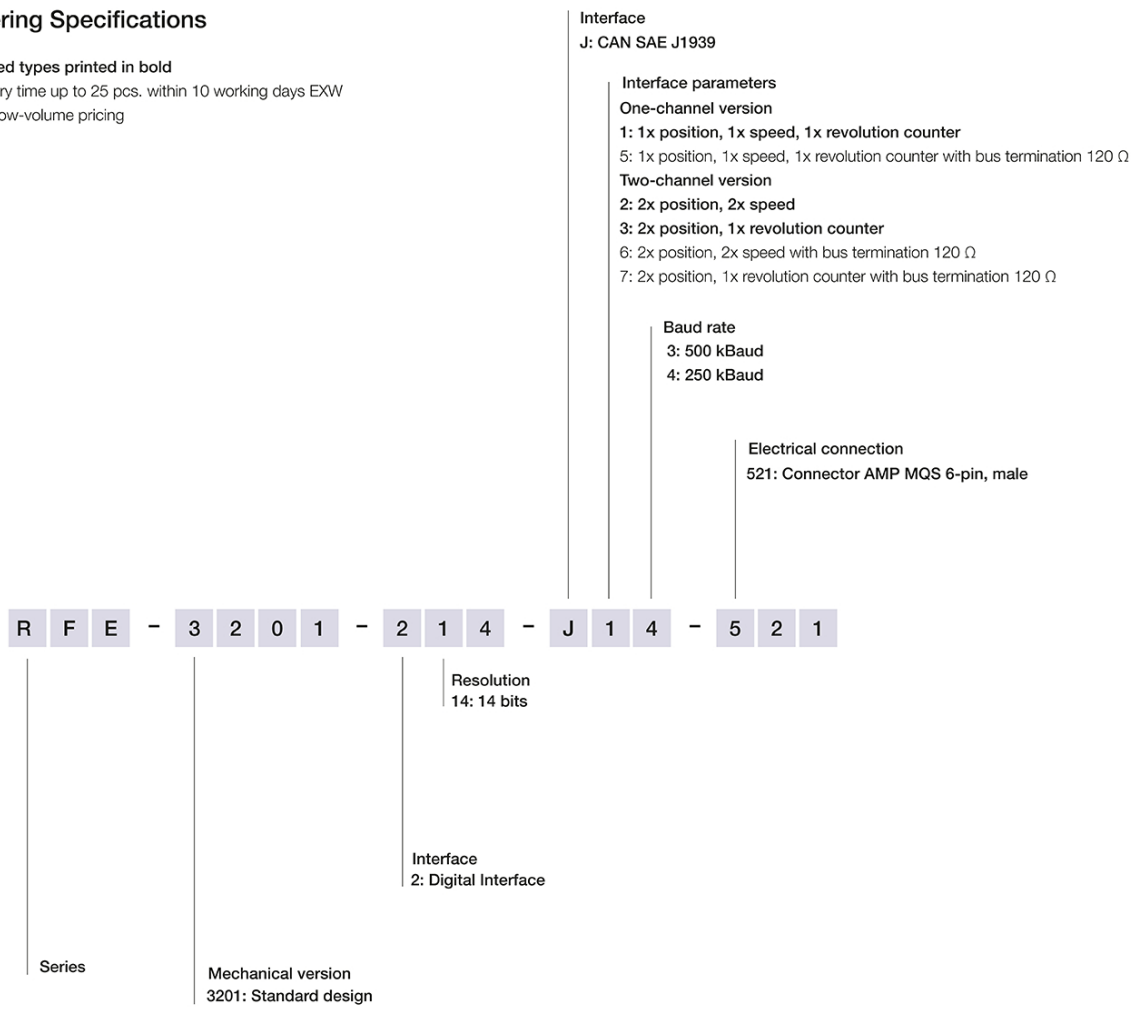
Description	
Material	Housing: high grade, temperature resistant plastic PBT GF30 with stainless steel inserts
Mounting	With 2 pan head screws M4x18 (included in delivery)
Fastening torque of mounting	max. 200 Ncm
Electrical connection	6-pin MQS-connector, code A, tinned contact according to drawing AMP-114-18063-126, Index A1 (Connector: AMP P/N 1-967616-1)

Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Weight	approx. 50 g

Ordering Specifications

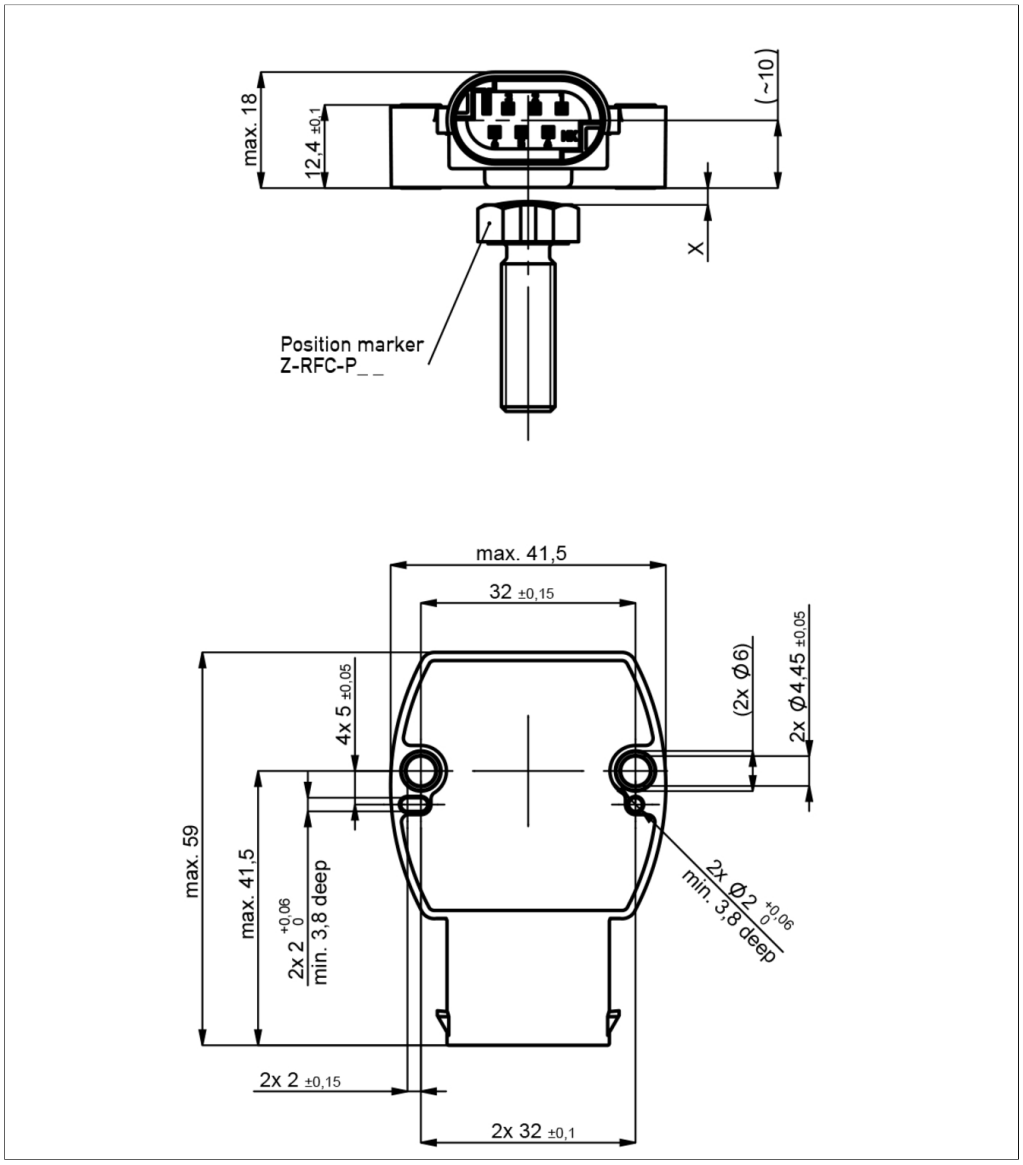
Ordering Specifications

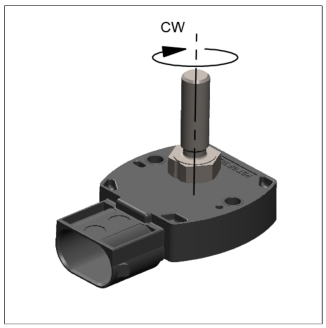
Preferred types printed in bold
- Delivery time up to 25 pcs. within 10 working days EXW
- Best low-volume pricing



Accessories included in delivery
- 2x Pan head screws M4x18

Drawing





When the marking of the position marker points towards the connector, the sensor is near the electrical center position (index position).

Technical Data

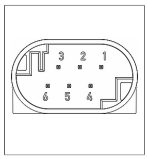
Type	**RFE-32_ _-214-J_ _-_ _ _** **CAN SAE J1939**
Measured variables	Position, speed, revolution counter
Measuring range	360°
Measuring range speed	0 ... 750 rpm
Number of channels	1 / 2
Protocol	CAN SAE J1939
Programmable parameters	Offset position, counting direction, averaging, baud rate, transmit mode, transmit cycle, source address, resolution position, resolution speed
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Node ID	128 ... 247 (dynamic address claiming)
Baud rate	250, 500 kBaud
Update rate (output)	1 kHz
Resolution	14 bits
Resolution speed	0.055°/s ... 2.2°/s
Linearity	≤ ±0.5 %FS
Repeatability	≤ ±0.1°
Hysteresis	≤ ±0.1°
Temperature error	±0.2 %FS
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Current consumption at Power-on	≤ 50 mA
Power drain w/o load	< 0.4 W
Overvoltage protection	45 VDC (permanent)
Polarity protection	yes (supply lines)
Short circuit protection	yes (all outputs vs. GND and supply voltage up to 40 VDC)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	120 Ω (optionally)
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 ISO 20653	IP67 / IP68 / IP69K
Operating temperature	-40 ... +105°C
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	843 years (one-channel) or 819 years (two-channel, per channel)
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
Conformity/Approval	

EMC Compatibility	
ISO 10605 ESD (Handling/Component)	8 kV
ISO 11452-2 Radiated HF-fields	100 V/m
ISO 11452-4 BCI (Bulk current injection)	200 mA
CISPR 25 Radiated emission	Level 3
ISO 7637-2 Transient Emissions	Level 4
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b, 4, 5) Level 4
ISO 7637-3 Pulses on output lines	(3a, 3b) Fast Level 2, Slow Level 4
ISO 16750 Pulses on supply lines	Starting profile Level 4 @12 V / Level 3 @24 V
Emission/Immunity	Exceeds E1 requirements

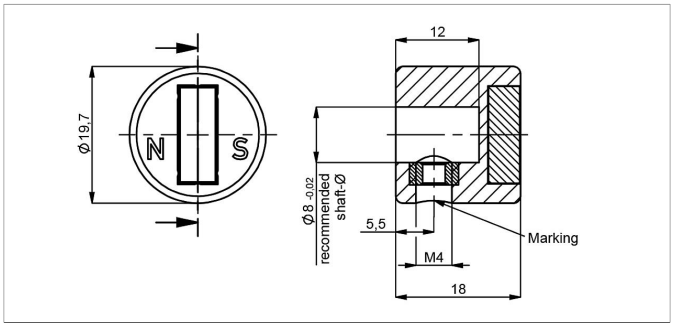
FS = Full scale: Signal span according to electrical measuring range

Connection Assignment

Signal	Connector code 5_ _
Supply voltage Ub	Pin 1
GND	Pin 2
CAN_H	Pin 3, pin 6
CAN_L	Pin 4, pin 5



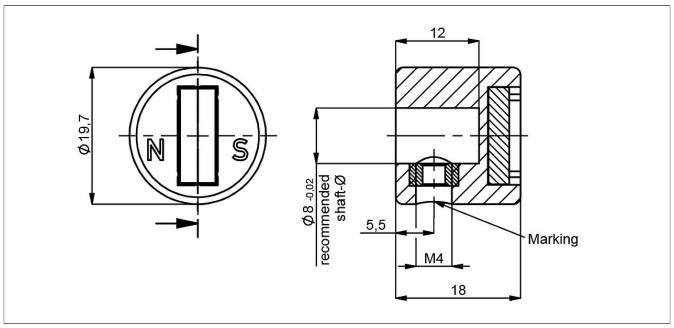
Position Markers



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
Operating temp.	-40 ... +125°C

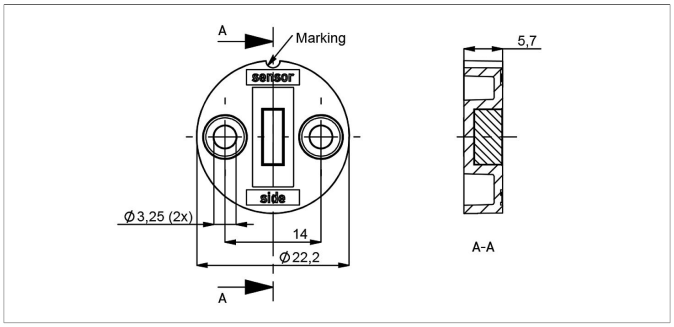
P/N	Pack. unit [pcs]
400056074	1
400056085	25



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 radial offset	± 3 mm
Operating temp.	-40 ... +125°C

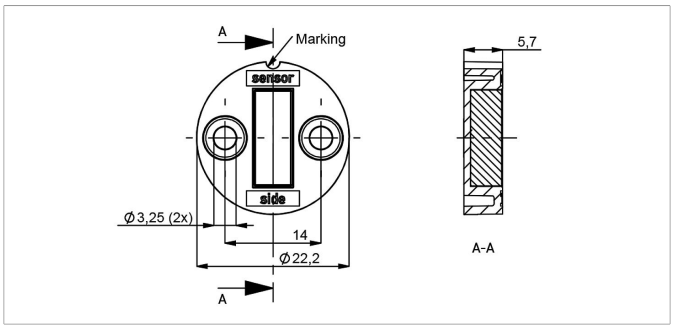
P/N	Pack. unit [pcs]
400105041	1
400105042	25



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

Material	PBT-GF
Max. permitted radial offset	± 1.5 mm
Operating temp.	-40 ... +125°C

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

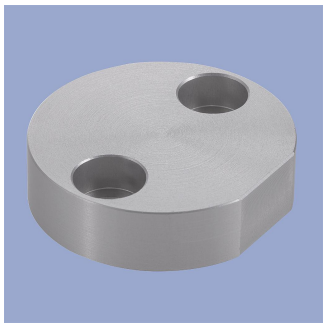


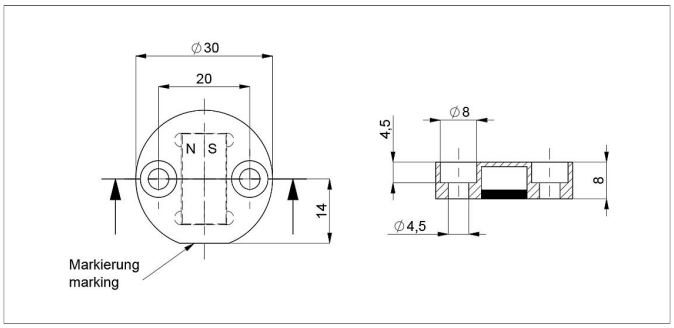
Z-RFC-P31
Position marker for frontal fixation with 2 cylinder screws M3x8 (included in delivery).

Material	PBT-GF
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

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

Position Markers

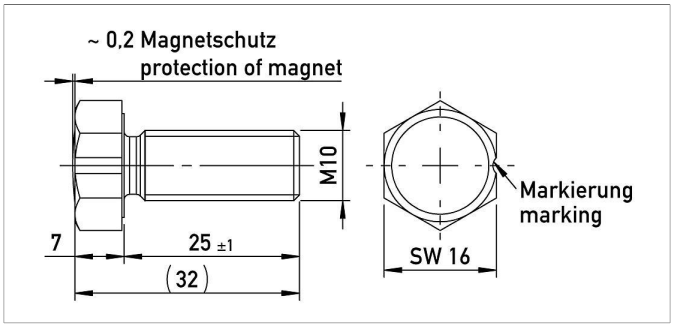




Z-RFC-P22
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock, included in delivery).
Attention: Closed side of position marker faces the active side of sensor.

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

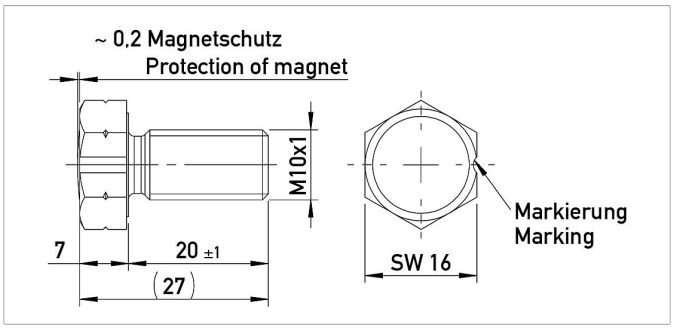
P/N	Pack. unit [pcs]
400106735	1
400106736	25



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

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

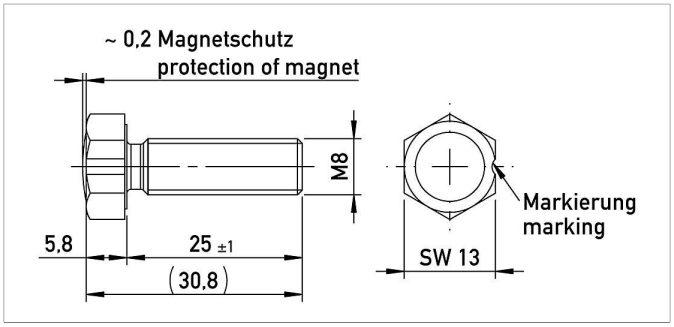
P/N	Pack. unit [pcs]
400104756	1
400104757	25



Z-RFC-P28
Screw position marker M10x1 x 20 mm, similar DIN 933, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

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

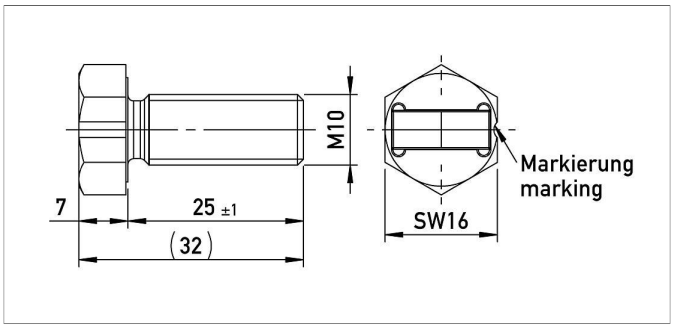


Z-RFC-P19
Screw position marker M8 x 25 mm, similar DIN 933/ISO 4017, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 1.5 mm
Operating temp.	-40 ... +125°C

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

Position Markers

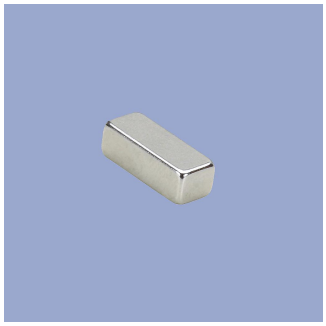


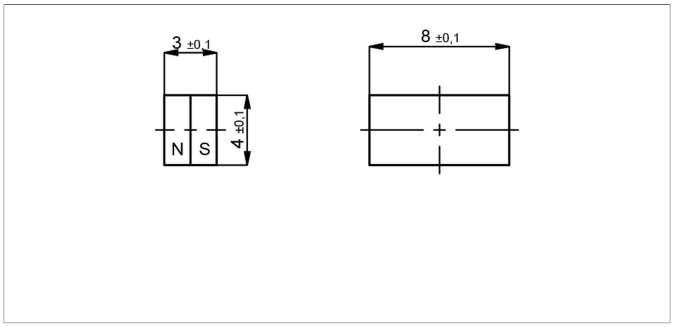
Z-RFC-P20

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



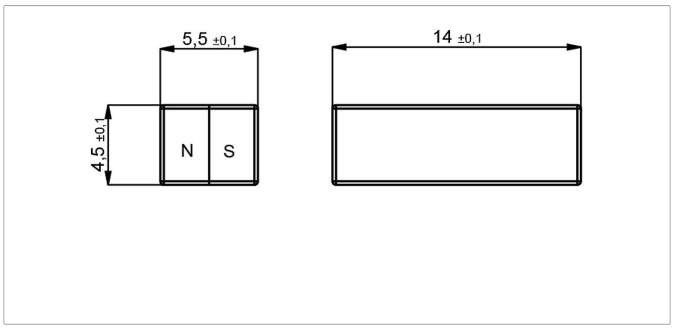


Z-RFC-P03

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

Position Markers

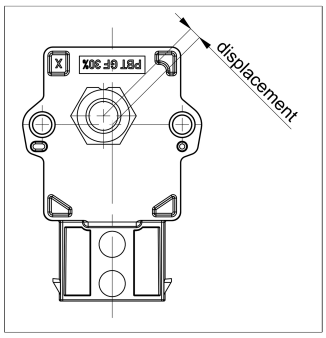
Working Distances Position Markers [mm] - One-channel Versions

Z-RFC-P03	Z-RFC-P04	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P20	Z-RFC-P22	Z-RFC-P23	Z-RFC-P30	Z-RFC-P31	Z-RFC-P43
0.4 ... 1.9	2 ... 4.7	0 ... 4	0 ... 1.8	2 ... 4.7	4.1 ... 8.9	2 ... 4.7	0.4 ... 1.9	2 ... 4.7	0 ... 2.4

Working Distances Position Markers [mm] - Redundant Versions

Z-RFC-P03	Z-RFC-P04	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P20	Z-RFC-P22	Z-RFC-P23	Z-RFC-P30	Z-RFC-P31	Z-RFC-P43
0... 1.5	1.6 ... 4.2	0 ... 3.5	0 ... 1.3	1.6 ... 4.2	3.6 ... 8.4	1.6 ... 4.2	0 ... 1.5	1.6 ... 4.2	0 ... 2

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.

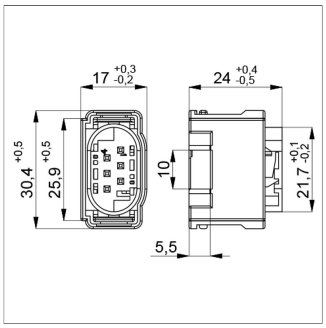
Additional Linearity Error at Radial Displacement - One-channel Versions

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: ±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

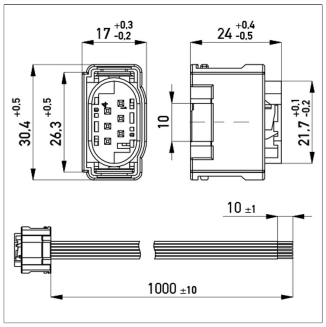
Z-RFC-P02 / P04 / P08 Z-RFC-P20 / P23 / P31	Z-RFC-P41 / P43 / P47	Z-RFC-P03 / P30	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P22
0.5 mm: ±0.7°	0.5 mm: ±0.7°	0.5 mm: ±2.5°	0.5 mm: ±1.1°	0.5 mm: ±2.3°	1.0 mm: ±1.1°
1.0 mm: ±1.8°	1.0 mm: ±1.8°	1.0 mm: ±6.4°	1.0 mm: ±2°	1.0 mm: ±4.5°	2.0 mm: ±2.4°
2.0 mm: ±5,2°	2.0 mm: ±5.2°	2.0 mm: -	2.0 mm: ±4.6°	2.0 mm: -	4.0 mm: ±6.7°

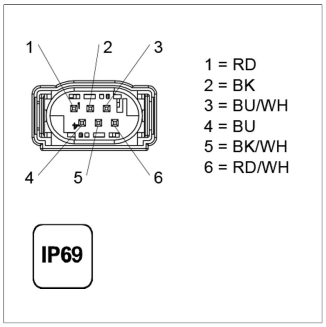
Connector System MQS



EEM-33-34
Connector kit MQS including
• 1 plug socket (female), PBT GF15, AMP P/N 1-967616-1
• 6 tinned contacts for cable cross-section area 0.25 ... 0.35 mm² (AWG 22), AMP-P/N 963727-1 or 5-962885-1
• 6 single conductor sealings AMP P/N 967067-2
Operating temp. -40 ... +120°C

P/N	Type
400005666	EEM-33-34





EEM-33-24
Connector MQS AMP P/N 1-967616-1, 6-pin, PBT GF15, with lead wires 0.5 mm², PVC, 1 m, open ended
Operating temp. -40 ... +120°C
Lead wires PVC, 6x0.5 mm²

P/N	Type	Length
400108029	EEM-33-24	1 m

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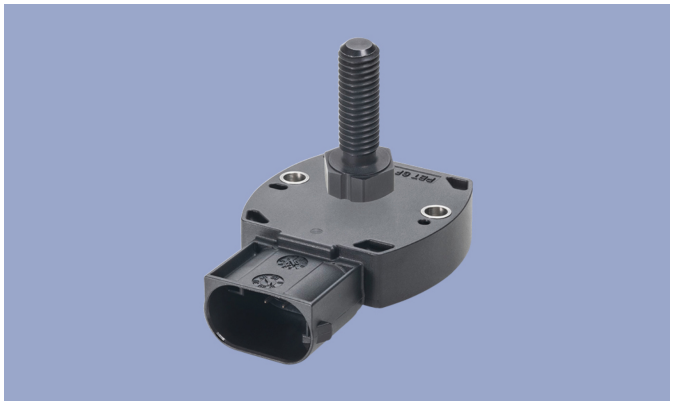
NOVOHALL
Rotary Sensor
Touchless

RFE-3200
CANopen
Mobile Applications



Special Features
- Touchless hall technology
- Electrical range 360°
- 2 part design, mechanically decoupled
- High protection class IP67, IP68, IP69K
- Resolution 14 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, exceeds E1 requirements
- Other configurations see separate data sheets

Applications
- Mobile working machines (industrial trucks, construction machinery, agricultural and forestry machinery)
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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.
The sensor is perfectly suitable for use in harsh environmental conditions through the completely encapsulated electronics.

Description

Material	Housing: high grade, temperature resistant plastic PBT GF30 with stainless steel inserts
Mounting	With 2 pan head screws M4x18 (included in delivery)
Fastening torque of mounting	max. 200 Ncm
Electrical connection	6-pin MQS-connector, code A, tinned contact according to drawing AMP-114-18063-126, Index A1 (Connector: AMP P/N 1-967616-1)

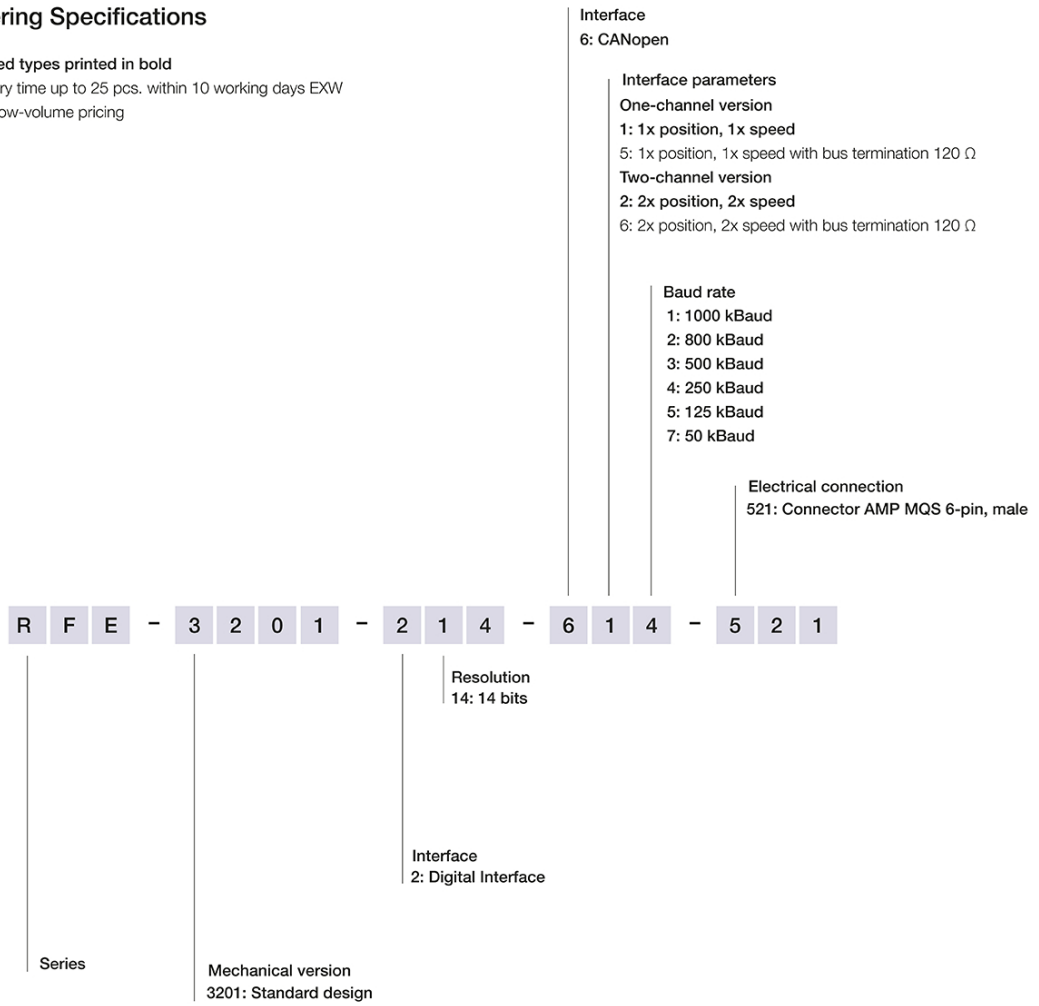
Mechanical Data

Dimensions	See dimension drawing
Mechanical travel	continuous
Weight	approx. 50 g

Ordering Specifications

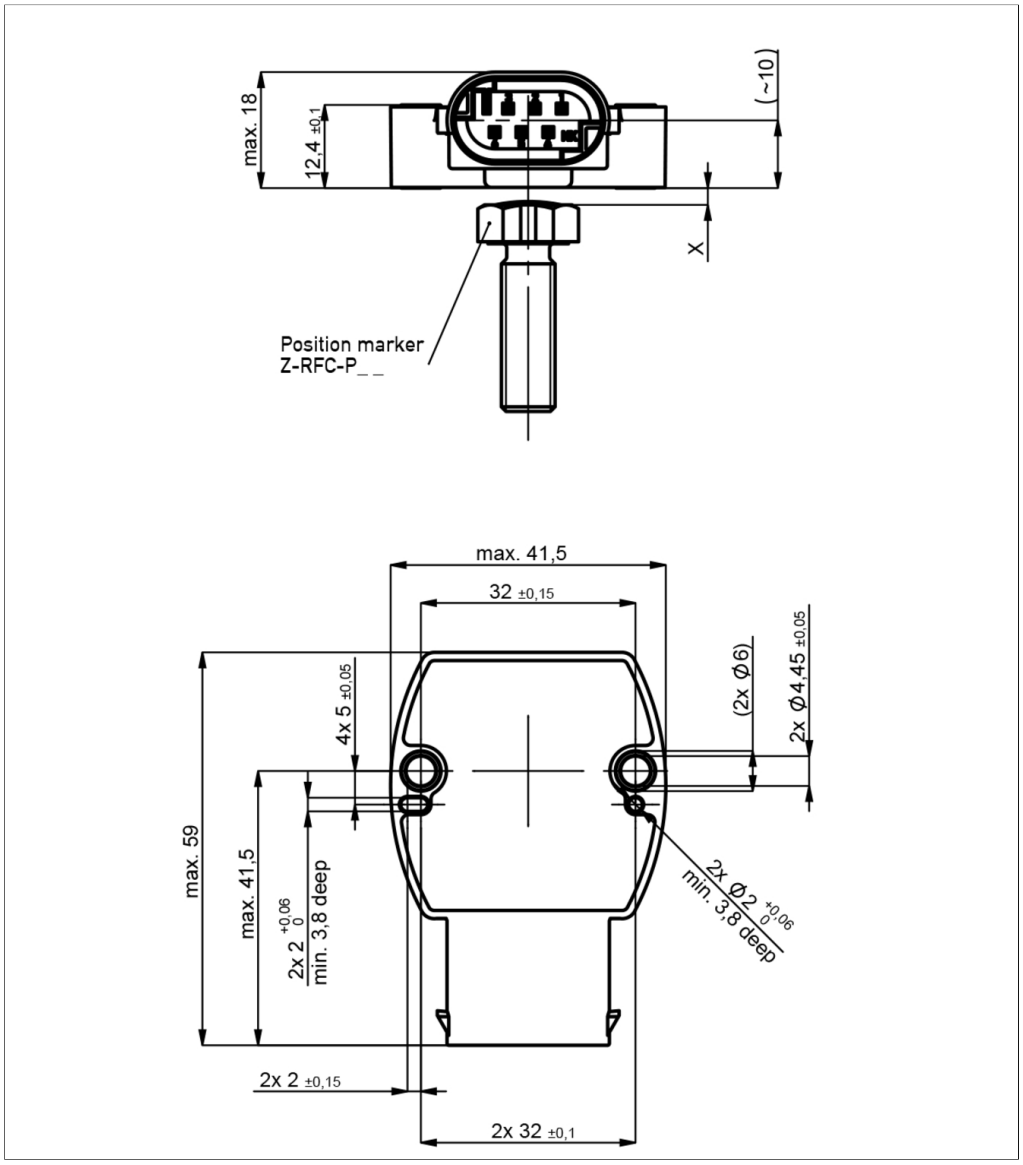
Ordering Specifications

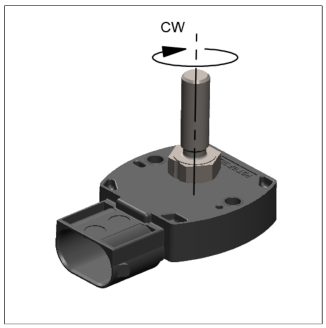
Preferred types printed in bold
- Delivery time up to 25 pcs. within 10 working days EXW
- Best low-volume pricing



Accessories included in delivery
- 2x Pan head screws M4x18

Drawing





When the marking of the position marker points towards the connector, the sensor is near the electrical center position (index position).

Technical Data

CANopen

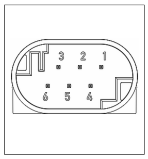
Type	**RFE-32_ _-214-6_ _-521**
	CANopen
Measured variables	Position and speed
Measuring range	360°
Measuring range speed	0 ... 1600 rpm
Number of channels	1 / 2
Protocol	CANopen protocol to CiA DS-301 V4.2.0, Device profile DS-406 V3.2 Encoder Class C2, LSS services to CiA DS-305 V1.1.2
Programmable parameters	Position, speed, cams, working areas, rotating direction, scale, offset, node ID, baud rate
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Node ID	1 ... 127 (default 127)
Baud rate	50 ... 1000 kBaud
Update rate	1 kHz
Resolution	14 bits
Resolution speed	360°/2^14 ≈ 0.022°/ms
Linearity	≤ ±0.5 %FS
Repeatability	≤ ±0.1°
Hysteresis	≤ ±0.1°
Temperature error	±0.2 %FS
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Current consumption at Power-on	≤ 50 mA
Power drain w/o load	< 0.4 W
Overvoltage protection	45 VDC (permanent)
Polarity protection	yes (supply lines)
Short circuit protection	yes (output vs. GND and supply voltage up to 40 VDC)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	120 Ω (optionally)
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 ISO 20653	IP67 / IP68 / IP69K
Operating temperature	-40 ... +105°C
Life	Mechanically unlimited
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	843 years (one-channel) or 819 years (two-channel, per channel)
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
ISO 11452-2 Radiated HF-fields	100 V/m
ISO 11452-5 Radiated HF-Fields, stripline	200 V/m
CISPR 25 Radiated emission	Level 3
ISO 7637-2 Transient Emissions	Level 3
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b, 4, 5) Level 4
ISO 7637-3 Pulses on output lines	Level 4
ISO 16750 Pulses on supply lines	Starting profile Level 4 @12 V / Level 3 @24 V
Emission/Immunity	Exceeds E1 requirements

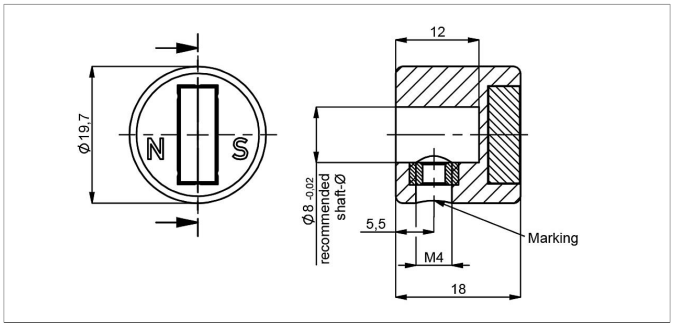
FS = Full scale: Signal span according to electrical measuring range

Connection Assignment

Signal	Connector code 5_ _
Supply voltage Ub	Pin 1
GND	Pin 2
CAN_H	Pin 3, pin 6
CAN_L	Pin 4, pin 5



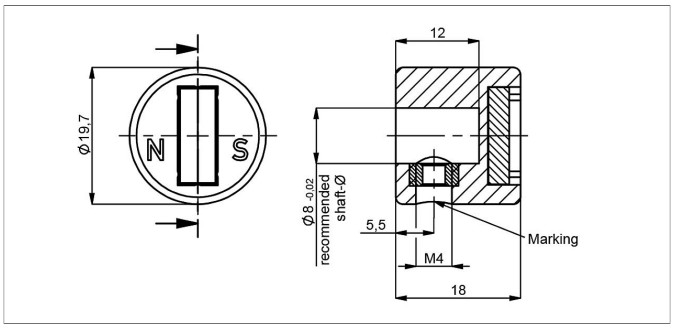
Position Markers



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
Operating temp.	-40 ... +125°C

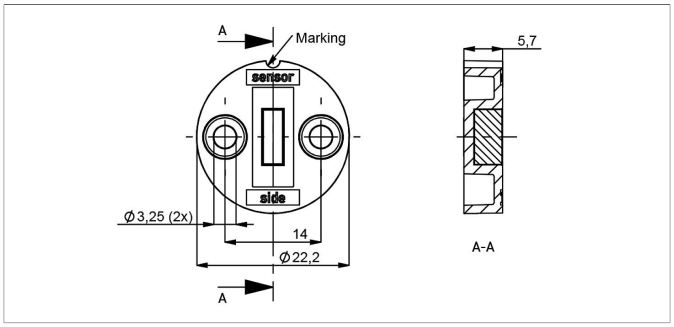
P/N	Pack. unit [pcs]
400056074	1
400056085	25



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 radial offset	± 3 mm
Operating temp.	-40 ... +125°C

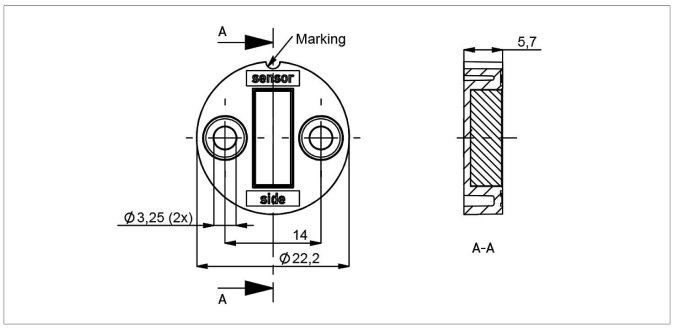
P/N	Pack. unit [pcs]
400105041	1
400105042	25



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

Material	PBT-GF
Max. permitted radial offset	± 1.5 mm
Operating temp.	-40 ... +125°C

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

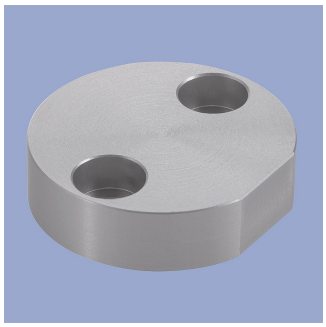


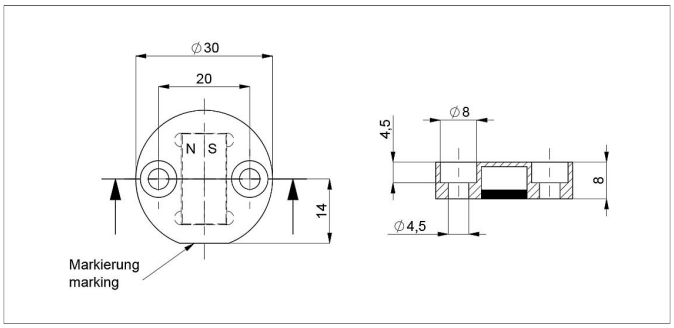
Z-RFC-P31
Position marker for frontal fixation with 2 cylinder screws M3x8 (included in delivery).

Material	PBT-GF
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

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

Position Markers

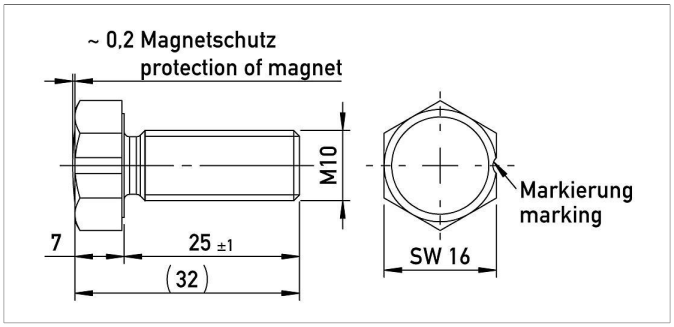




Z-RFC-P22
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock, included in delivery).
Attention: Closed side of position marker faces the active side of sensor.

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

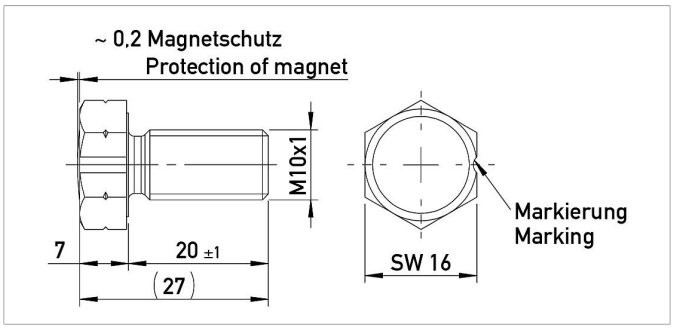
P/N	Pack. unit [pcs]
400106735	1
400106736	25



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

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

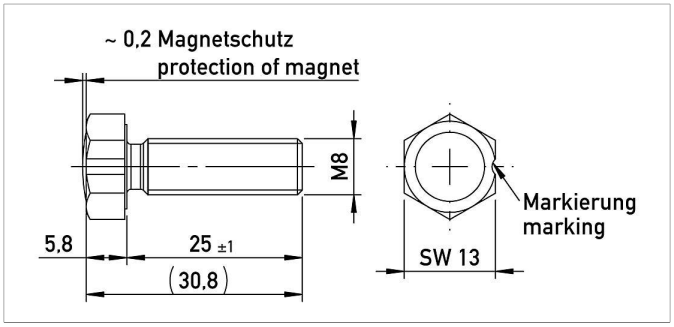
P/N	Pack. unit [pcs]
400104756	1
400104757	25



Z-RFC-P28
Screw position marker M10x1 x 20 mm, similar DIN 933, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

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

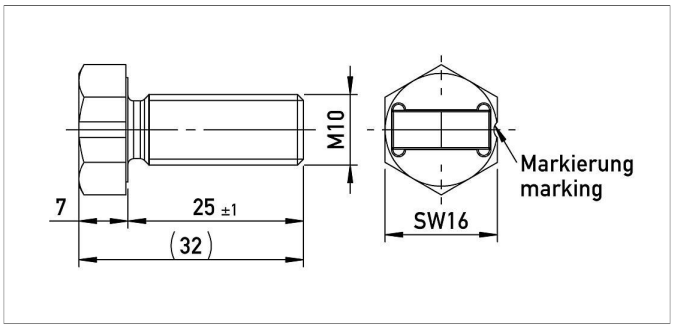


Z-RFC-P19
Screw position marker M8 x 25 mm, similar DIN 933/ISO 4017, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 1.5 mm
Operating temp.	-40 ... +125°C

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

Position Markers

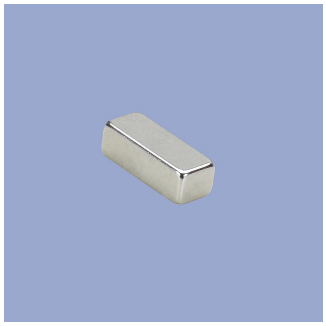


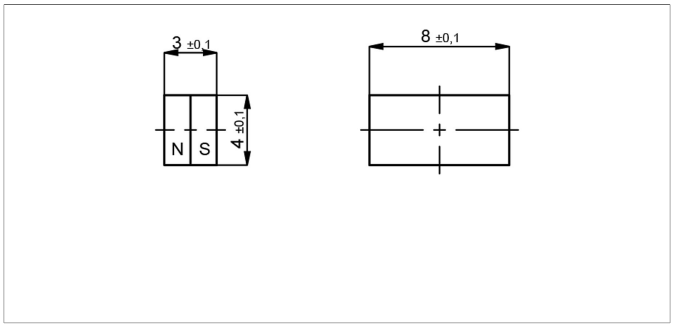
Z-RFC-P20

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



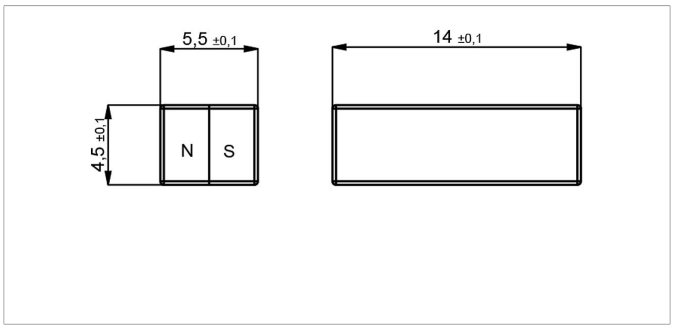


Z-RFC-P03

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

Position Markers

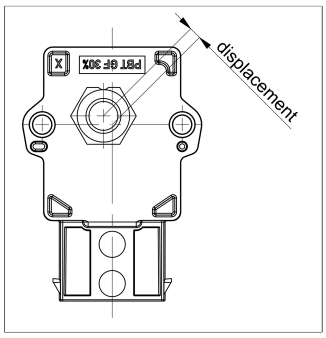
Working Distances Position Markers [mm] - One-channel Versions

Z-RFC-P03	Z-RFC-P04	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P20	Z-RFC-P22	Z-RFC-P23	Z-RFC-P30	Z-RFC-P31	Z-RFC-P43
0.4 ... 1.9	2 ... 4.7	0 ... 4	0 ... 1.8	2 ... 4.7	4.1 ... 8.9	2 ... 4.7	0.4 ... 1.9	2 ... 4.7	0 ... 2.4

Working Distances Position Markers [mm] - Redundant Versions

Z-RFC-P03	Z-RFC-P04	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P20	Z-RFC-P22	Z-RFC-P23	Z-RFC-P30	Z-RFC-P31	Z-RFC-P43
0... 1.5	1.6 ... 4.2	0 ... 3.5	0 ... 1.3	1.6 ... 4.2	3.6 ... 8.4	1.6 ... 4.2	0 ... 1.5	1.6 ... 4.2	0 ... 2

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.

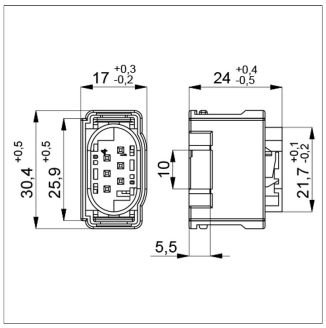
Additional Linearity Error at Radial Displacement - One-channel Versions

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: ±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

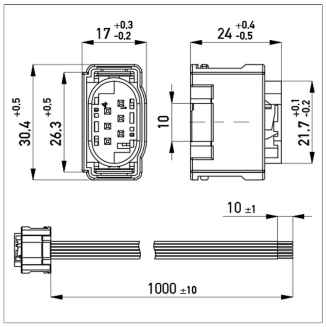
Z-RFC-P02 / P04 / P08 Z-RFC-P20 / P23 / P31	Z-RFC-P41 / P43 / P47	Z-RFC-P03 / P30	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P22
0.5 mm: ±0.7°	0.5 mm: ±0.7°	0.5 mm: ±2.5°	0.5 mm: ±1.1°	0.5 mm: ±2.3°	1.0 mm: ±1.1°
1.0 mm: ±1.8°	1.0 mm: ±1.8°	1.0 mm: ±6.4°	1.0 mm: ±2°	1.0 mm: ±4.5°	2.0 mm: ±2.4°
2.0 mm: ±5,2°	2.0 mm: ±5.2°	2.0 mm: -	2.0 mm: ±4.6°	2.0 mm: -	4.0 mm: ±6.7°

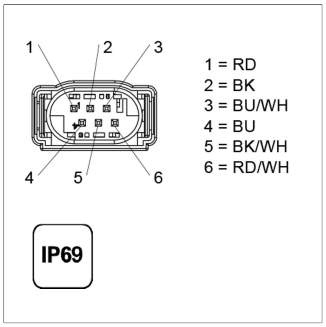
Connector System MQS



EEM-33-34
Connector kit MQS including
• 1 plug socket (female), PBT GF15, AMP P/N 1-967616-1
• 6 tinned contacts for cable cross-section area 0.25 ... 0.35 mm² (AWG 22), AMP-P/N 963727-1 or 5-962885-1
• 6 single conductor sealings AMP P/N 967067-2
Operating temp. -40 ... +120°C

P/N	Type
400005666	EEM-33-34





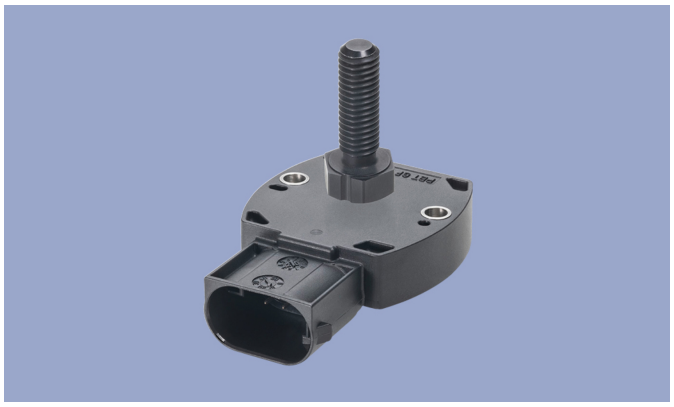
EEM-33-24
Connector MQS AMP P/N 1-967616-1, 6-pin, PBT GF15, with lead wires 0.5 mm², PVC, 1 m, open ended
Operating temp. -40 ... +120°C
Lead wires PVC, 6x0.5 mm²

P/N	Type	Length
400108029	EEM-33-24	1 m

novotechnik
Siedle Group

NOVOHALL
Rotary Sensor
Touchless

RFE-3200
Ratiometric
Mobile Applications



Special Features
- Touchless hall technology
- Electrical range up to 360°
- 2 part design, mechanically decoupled
- High protection class IP67, IP68, IP69K
- Resolution up to 12 bit
- Wear-free
- Temperature range -40 °C to +125 °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 PBT GF30 with stainless steel inserts
Mounting	With 2 pan head screws M4x18 (included in delivery)
Fastening torque of mounting	max. 200 Ncm
Electrical connection	6-pin MQS-connector, code A, tinned contact according to drawing AMP-114-18063-126, Index A1 (Connector: AMP P/N 1-967616-1)

Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Weight	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
521: Connector AMP MQS 6-pin, male

R	F	E	–	3	2	0	1	–	6	3	6	–	2	1	1	–	5	2	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: 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)

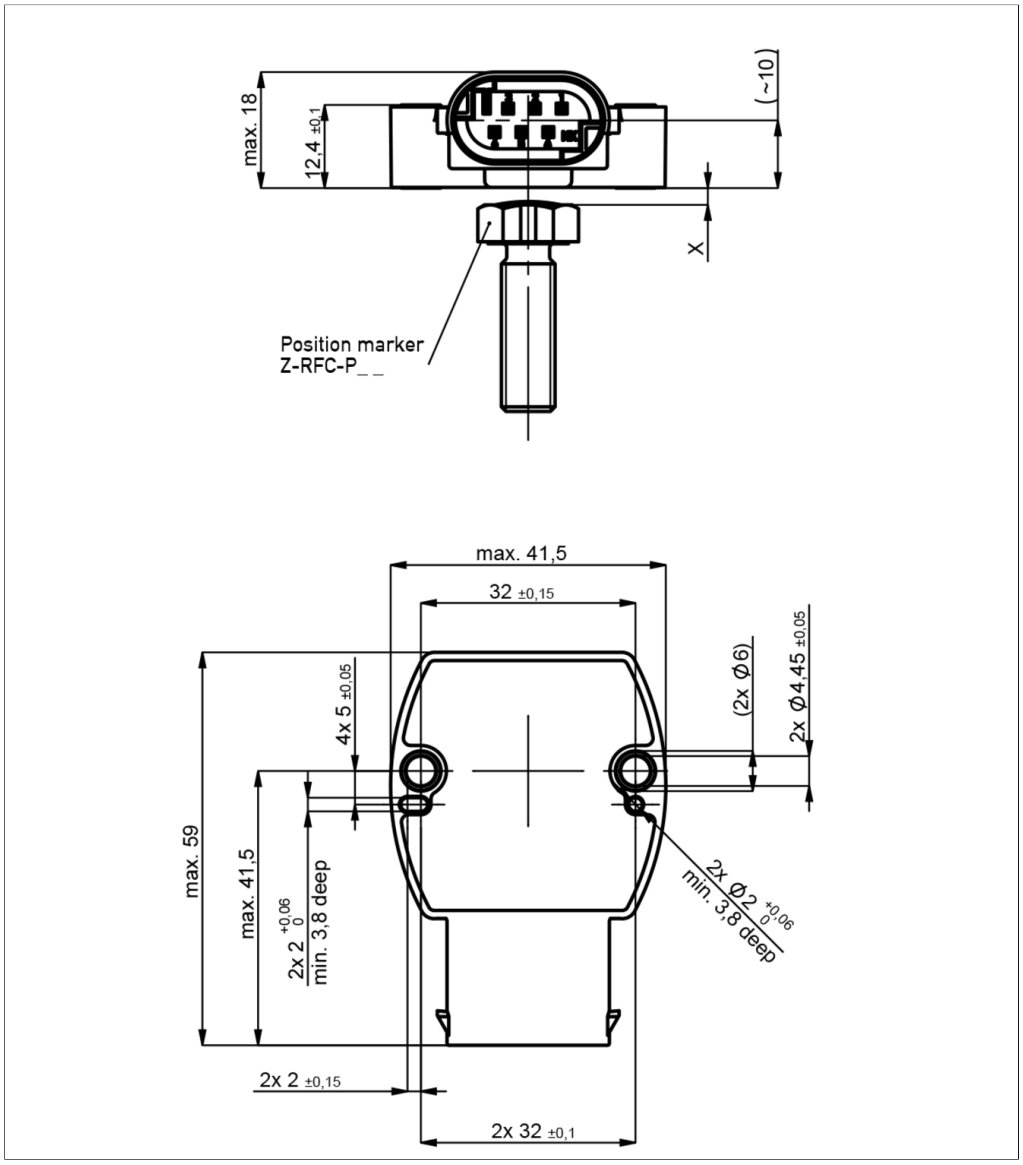
Series

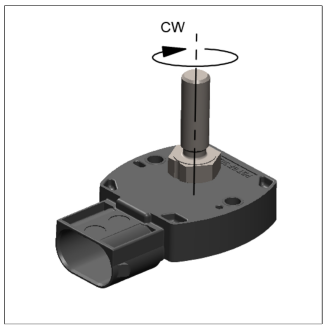
Mechanical version
3201: Standard design

Accessories included in delivery

- 2x Pan head screws M4x18

Drawing





When the marking of the position marker points towards the connector, the sensor is near the electrical center position (index position).

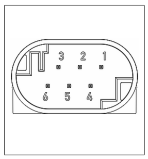
Technical Data

Type	**RFE-32_ _-_ _ _-2_ _-521** **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
Overvoltage protection	24 VDC (60 min.)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (vs. GND and supply voltage Ub)
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 ISO 20653	IP67 / IP68 / IP69K
Operating temperature	-40 ... +125°C
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	
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
Conformity/Approval	
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

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

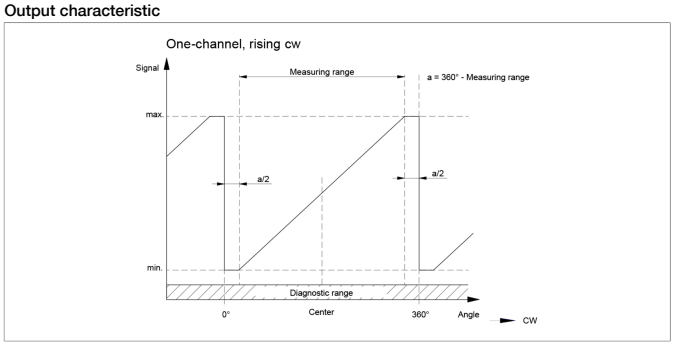
Connection Assignment

	One-channel	Partly redundant	Fully redundant
Supply voltage Ub 1	Pin 1	Pin 1 / Pin 6	Pin 1
GND 1	Pin 2	Pin 2 / Pin 5	Pin 2
Signal output 1	Pin 4	Pin 4	Pin 4
Signal output 2	-	Pin 3	Pin 3
Supply voltage Ub 2	-	-	Pin 6
GND 2	-	-	Pin 5
Not assigned	Pin 3, Pin 5, Pin 6	-	-

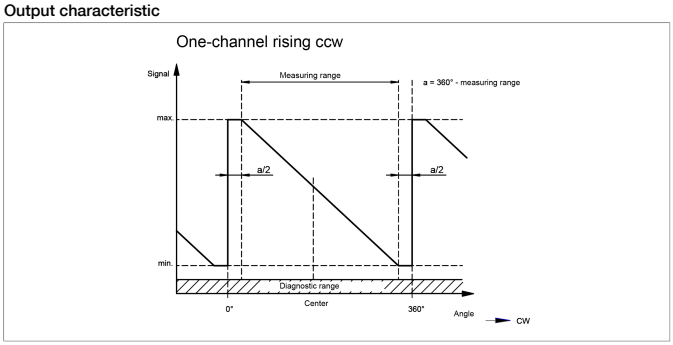


Technical Data
Output Characteristics

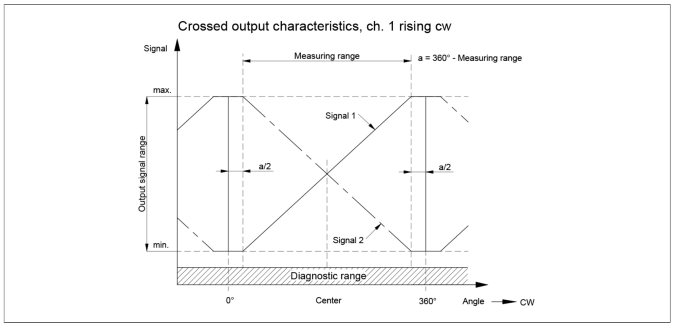
Output characteristic



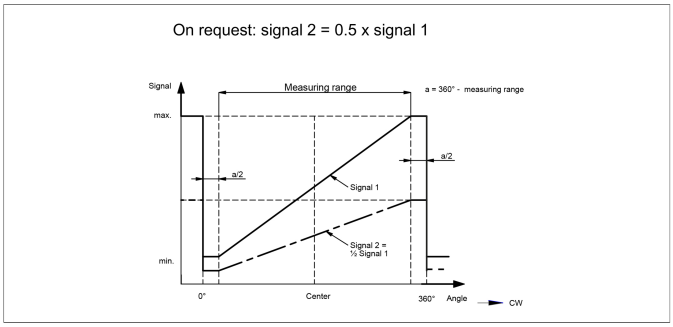
Output characteristic



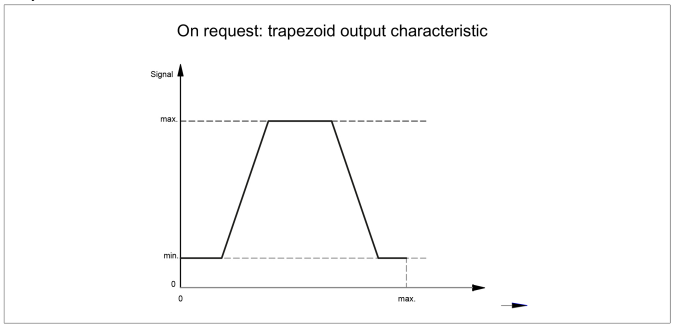
Output characteristic



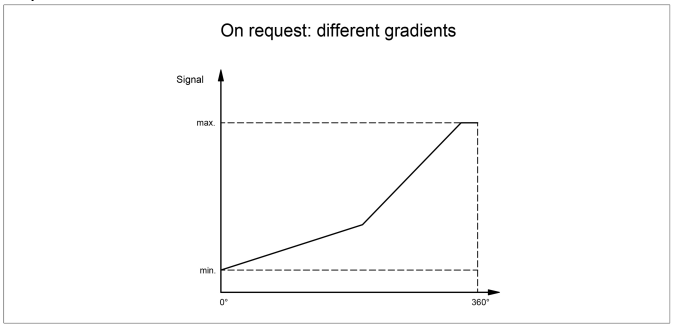
Output characteristic



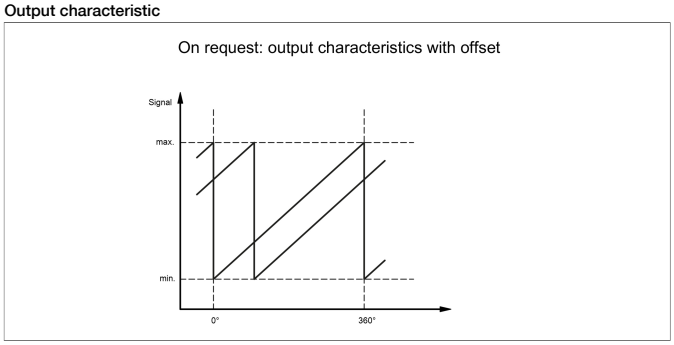
Output characteristic



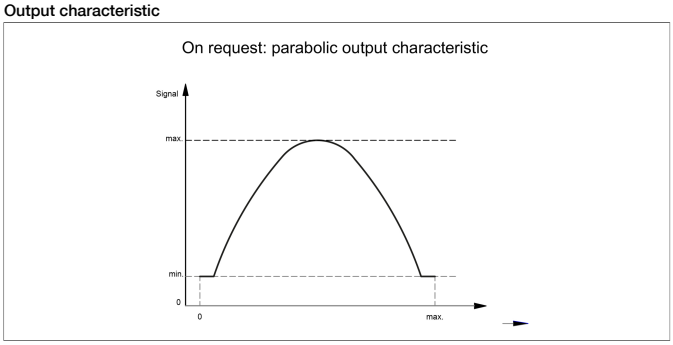
Output characteristic



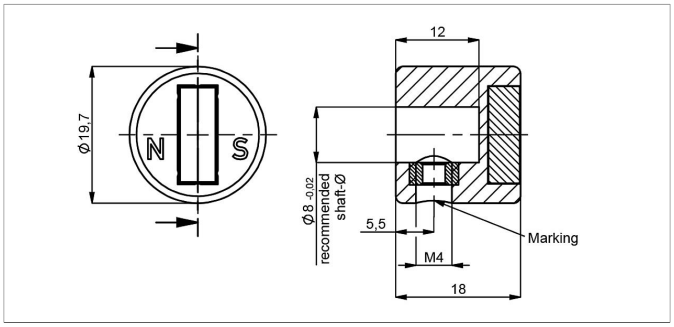
Output characteristic



Output characteristic



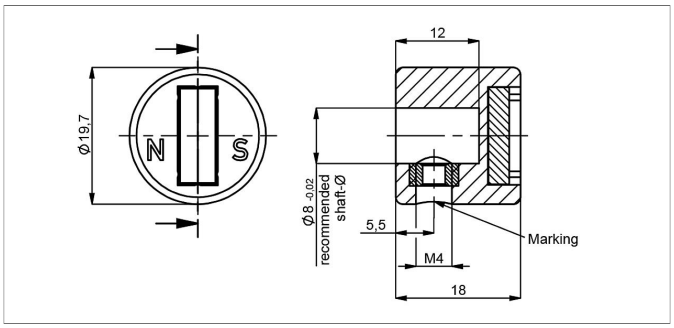
Position Markers



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
Operating temp.	-40 ... +125°C

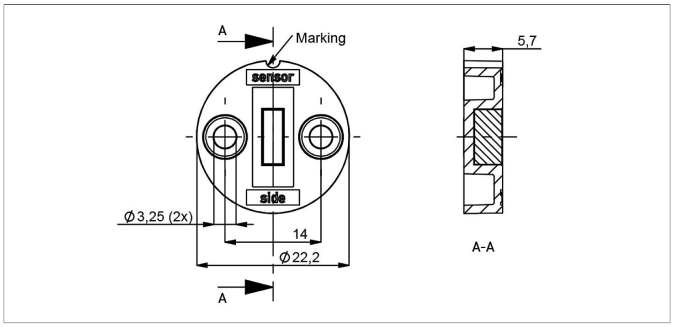
P/N	Pack. unit [pcs]
400056074	1
400056085	25



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 radial offset	± 3 mm
Operating temp.	-40 ... +125°C

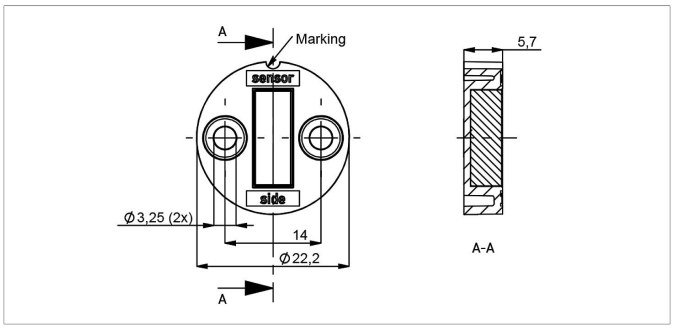
P/N	Pack. unit [pcs]
400105041	1
400105042	25



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

Material	PBT-GF
Max. permitted radial offset	± 1.5 mm
Operating temp.	-40 ... +125°C

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

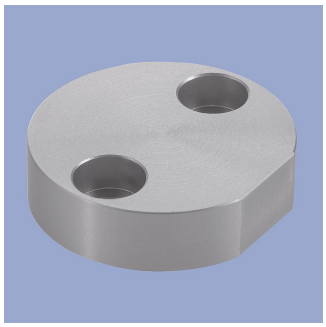


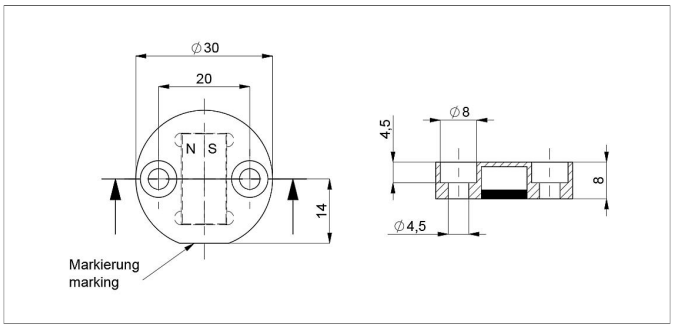
Z-RFC-P31
Position marker for frontal fixation with 2 cylinder screws M3x8 (included in delivery).

Material	PBT-GF
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

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

Position Markers

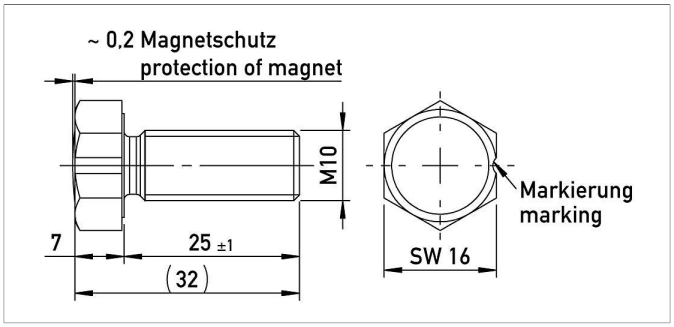




Z-RFC-P22
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock, included in delivery).
Attention: Closed side of position marker faces the active side of sensor.

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

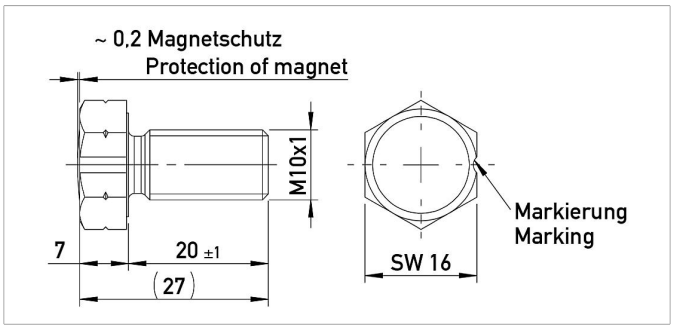
P/N	Pack. unit [pcs]
400106735	1
400106736	25



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

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

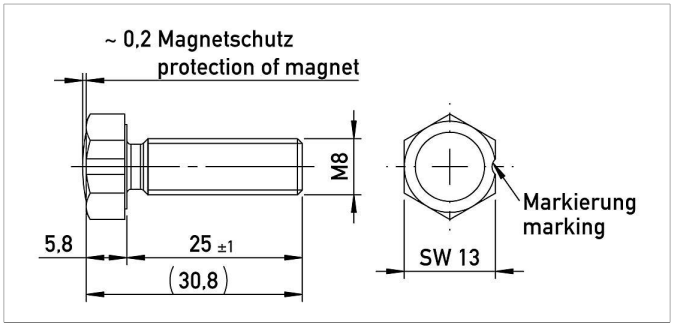
P/N	Pack. unit [pcs]
400104756	1
400104757	25



Z-RFC-P28
Screw position marker M10x1 x 20 mm, similar DIN 933, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

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

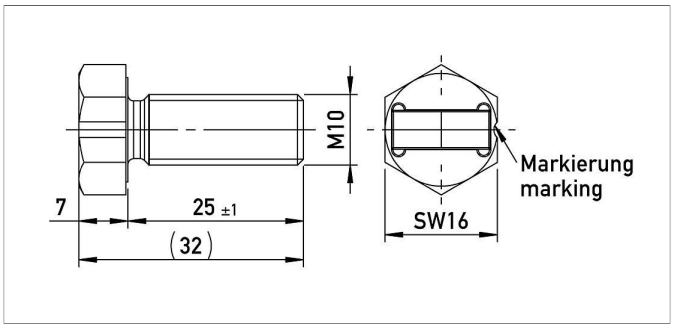


Z-RFC-P19
Screw position marker M8 x 25 mm, similar DIN 933/ISO 4017, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 1.5 mm
Operating temp.	-40 ... +125°C

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

Position Markers

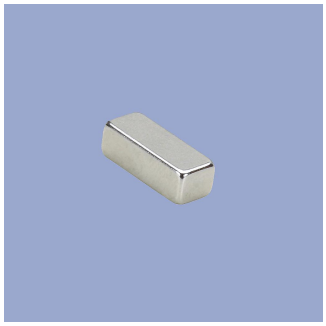


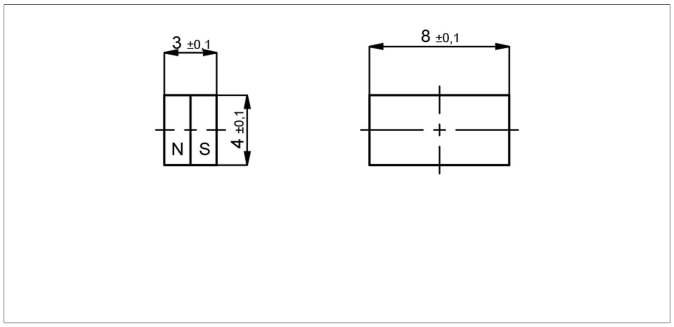
Z-RFC-P20

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



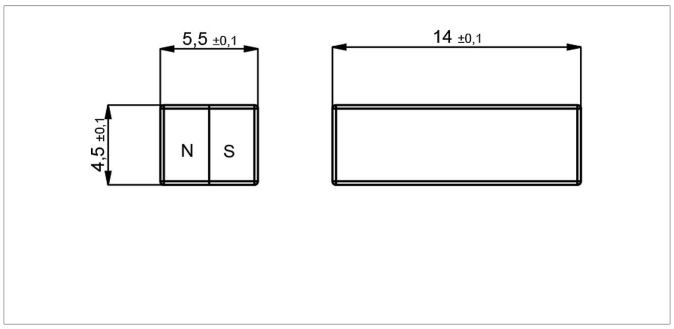


Z-RFC-P03

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

Position Markers

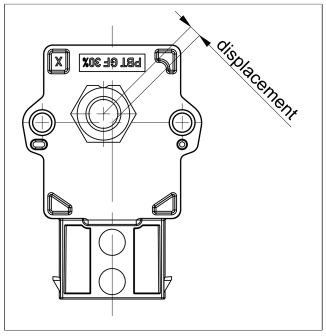
Working Distances Position Markers [mm] - One-channel Versions

Z-RFC-P03	Z-RFC-P04	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P20	Z-RFC-P22	Z-RFC-P23	Z-RFC-P30	Z-RFC-P31	Z-RFC-P43
0.4 ... 1.9	2 ... 4.7	0 ... 4	0 ... 1.8	2 ... 4.7	4.1 ... 8.9	2 ... 4.7	0.4 ... 1.9	2 ... 4.7	0 ... 2.4

Working Distances Position Markers [mm] - Redundant Versions

Z-RFC-P03	Z-RFC-P04	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P20	Z-RFC-P22	Z-RFC-P23	Z-RFC-P30	Z-RFC-P31	Z-RFC-P43
0... 1.5	1.6 ... 4.2	0 ... 3.5	0 ... 1.3	1.6 ... 4.2	3.6 ... 8.4	1.6 ... 4.2	0 ... 1.5	1.6 ... 4.2	0 ... 2

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.

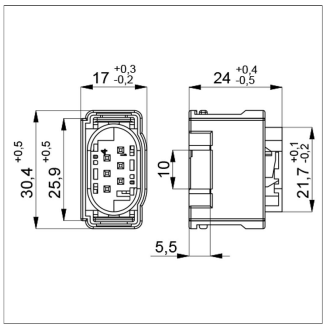
Additional Linearity Error at Radial Displacement - One-channel Versions

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: ±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 / P28	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°

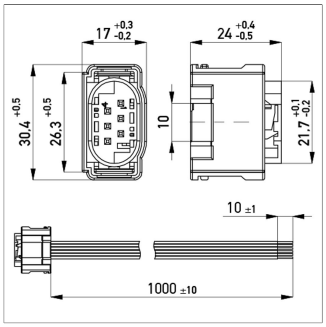
Connector System MQS

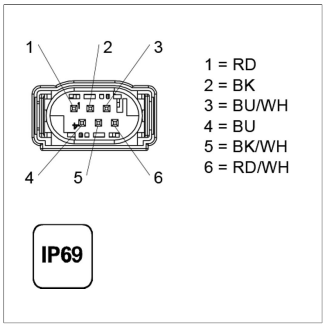


EEM-33-34
Connector kit MQS including
• 1 plug socket (female), PBT GF15, AMP P/N 1-967616-1
• 6 tinned contacts for cable cross-section area 0.25 ... 0.35 mm² (AWG 22), AMP-P/N 963727-1 or 5-962885-1
• 6 single conductor sealings AMP P/N 967067-2

Operating temp. -40 ... +120°C

P/N	Type
400005666	EEM-33-34





EEM-33-24
Connector MQS AMP P/N 1-967616-1, 6-pin, PBT GF15, with lead wires 0.5 mm², PVC, 1 m, open ended

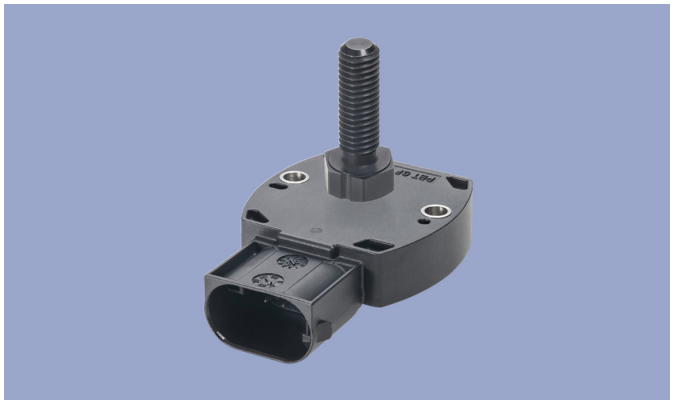
Operating temp. -40 ... +120°C
Lead wires PVC, 6x0.5 mm²

P/N	Type	Length
400108029	EEM-33-24	1 m

novotechnik
Siedle Group

NOVOHALL
Rotary Sensor
Touchless

RFE-3200
Current
Mobile Applications



Special Features
- Touchless hall technology
- Electrical range up to 360°
- 2 part design, mechanically decoupled
- High protection class IP67, IP68, IP69K
- 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

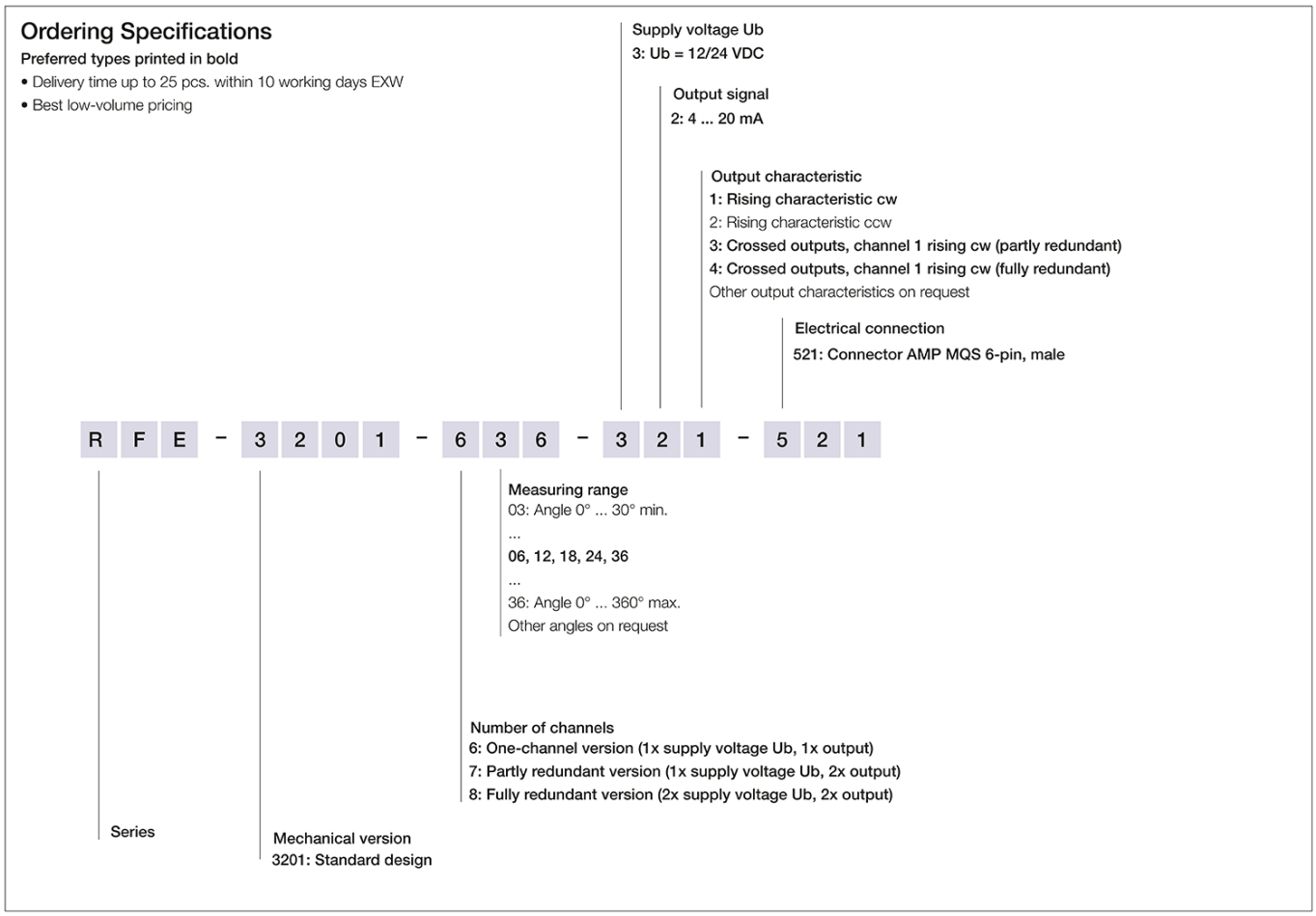
Applications
- Mobile working machines (industrial trucks, construction machinery, agricultural and forestry machinery)
- Marine applications

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 PBT GF30 with stainless steel inserts
Mounting	With 2 pan head screws M4x18 (included in delivery)
Fastening torque of mounting	max. 200 Ncm
Electrical connection	6-pin MQS-connector, code A, tinned contact according to drawing AMP-114-18063-126, Index A1 (Connector: AMP P/N 1-967616-1)

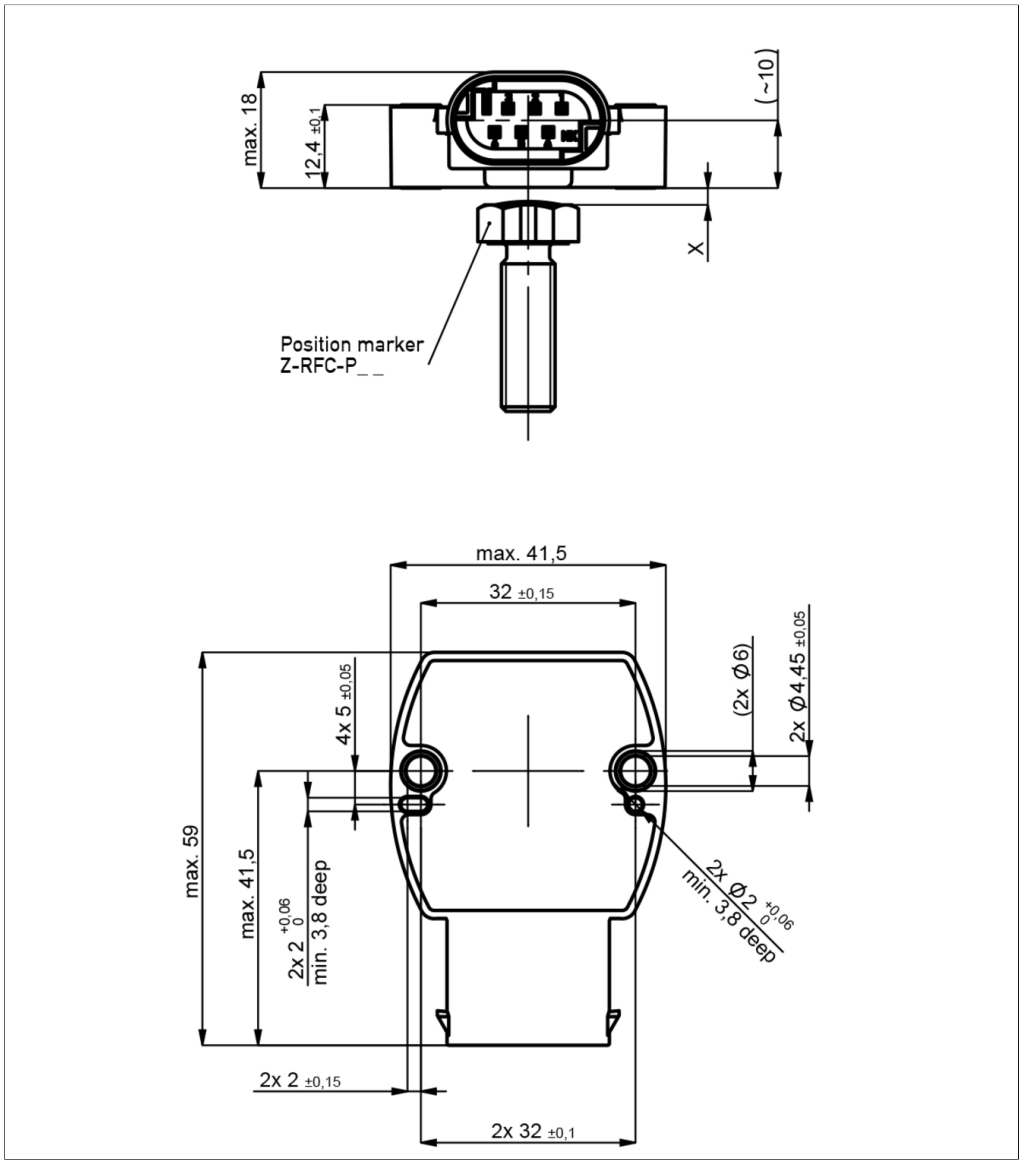
Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Weight	approx. 50 g

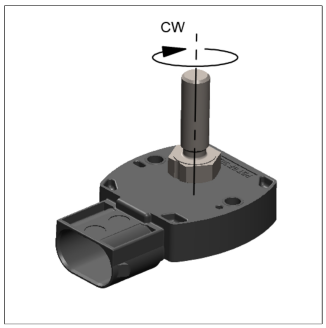
Ordering Specifications



Accessories included in delivery
• 2x Pan head screws M4x18

Drawing





When the marking of the position marker points towards the connector, the sensor is near the electrical center position (index position).

Technical Data

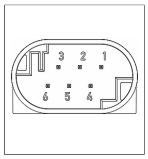
Type	**RFE-32_ _-_ _ _-32_-521**
	Analog current
Output signal	4 ... 20 mA
Burden	@Ub > 13 V: ≤ 500 Ω, @Ub ≤ 13 V: ≤ 250 Ω
Number of channels	1 / 2
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Update rate	typ. 3.4 kHz
Measuring range	0 ... 30° up to 0 ... 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. ±1.2 %FS, Measuring range ≥ 180°: typ. ±0.6 %FS
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Current consumption w/o load	typ. 12 mA per channel
Overvoltage protection	60 VDC (10 min.)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (vs. GND and supply voltage Ub)
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 ISO 20653	IP67 / IP68 / IP69K
Operating temperature	-40 ... +105°C* * The max. operating temperature depends on supply voltage Ub and burden (see temp.diagram)
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)	726 years (one-channel), 448 years (partly redundant, per channel) or 364 years (fully redundant, per channel)
MTTFd (EN ISO 13849-1 parts count method, w/o load)	1453 years (one-channel), 896 years (partly redundant, per channel) or 727 years (fully redundant, per channel)
MTTFd-certificate	
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
Conformity/Approval	

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
ISO 7637-2 Transient Emissions	Level 3
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b, 4, 5) Level 4
ISO 7637-3 Pulses on output lines	Level 4
EN 13309 Construction machinery	
Emission/Immunity E1	acc. to ECE-R10
ISO 13766-1/-2 Construction machinery	Any multi-channel version

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

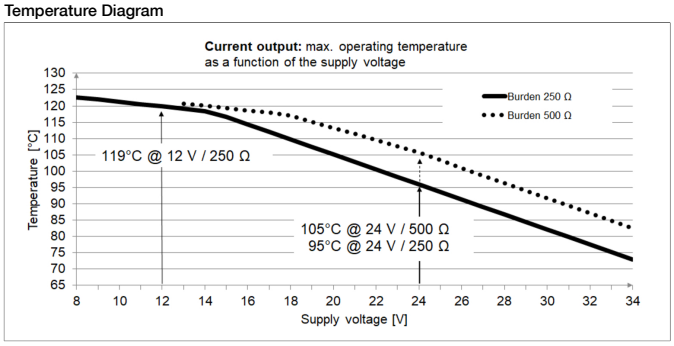
Connection Assignment

Signal	Connector code 5_ _	Connector code 5_ _	Connector code 5_ _
	One-channel	Partly redundant	Fully redundant
Supply voltage Ub 1	Pin 1	Pin 1	Pin 1
GND 1	Pin 2	Pin 2	Pin 2
Signal output 1	Pin 4	Pin 4	Pin 4
Signal output 2	-	Pin 3	Pin 3
Supply voltage Ub 2	-	-	Pin 6
GND 2	-	-	Pin 5
Not assigned	Pin 3, Pin 5, Pin 6	Pin 5, Pin 6	-

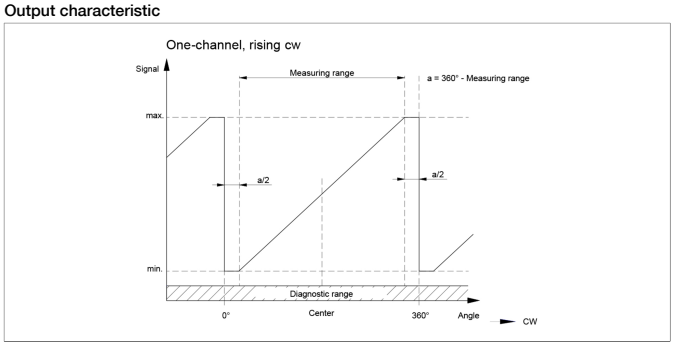


Technical Data
Output Characteristics

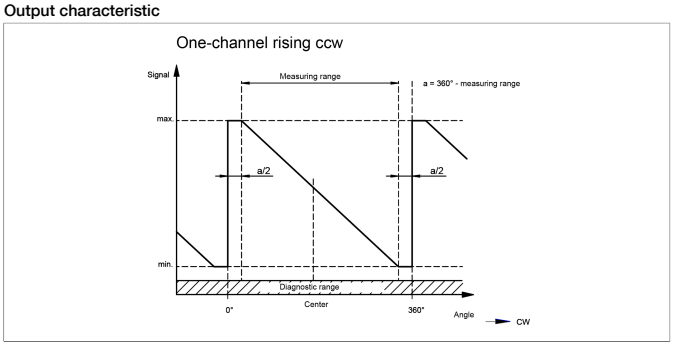
Temperature Diagram



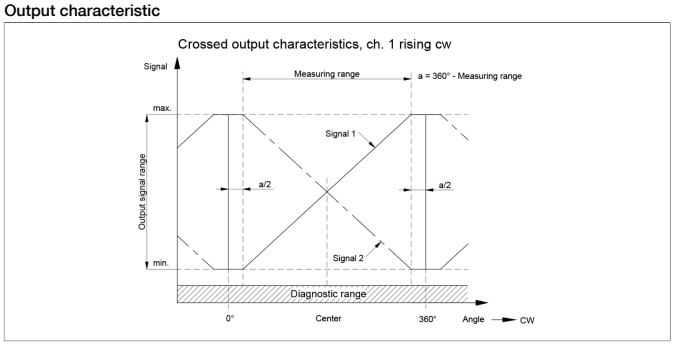
Output characteristic



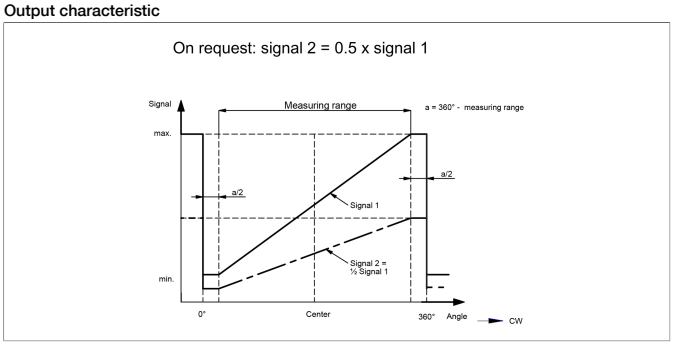
Output characteristic



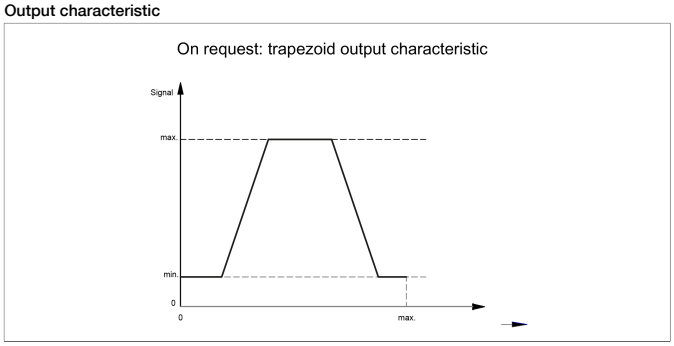
Output characteristic



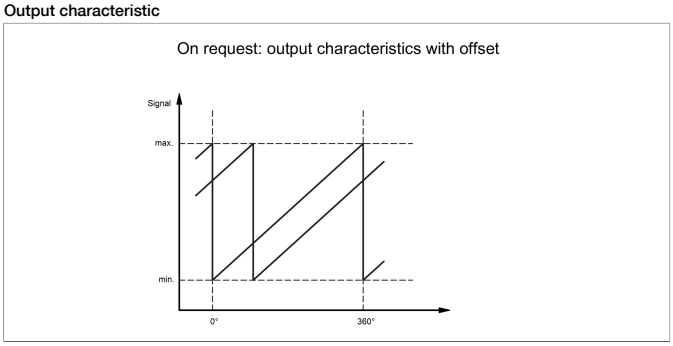
Output characteristic



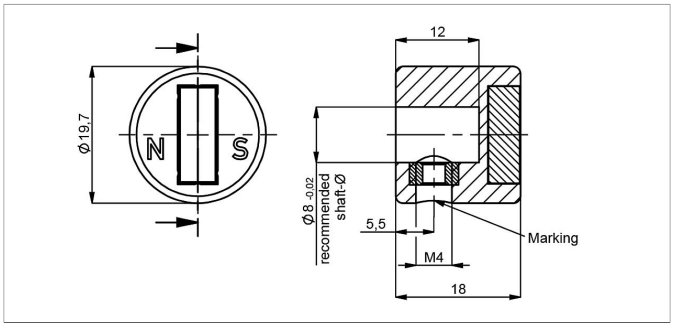
Output characteristic



Output characteristic



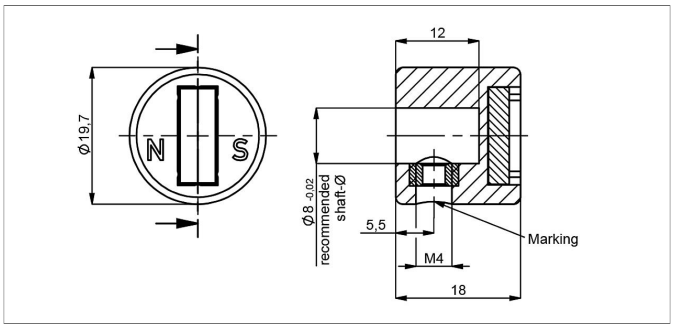
Position Markers



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
Operating temp.	-40 ... +125°C

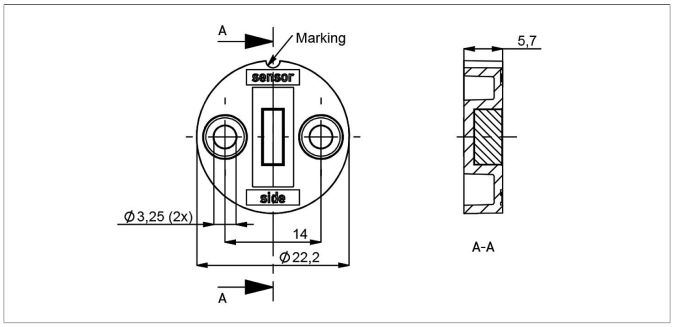
P/N	Pack. unit [pcs]
400056074	1
400056085	25



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 radial offset	± 3 mm
Operating temp.	-40 ... +125°C

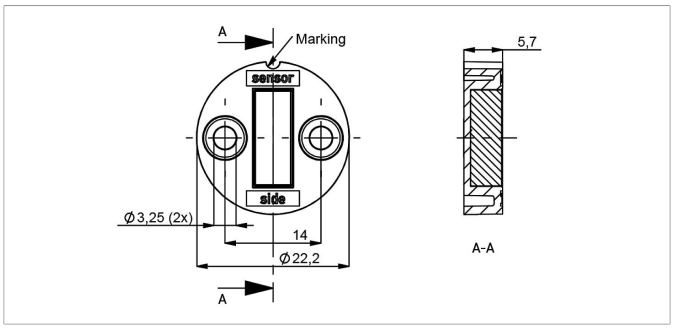
P/N	Pack. unit [pcs]
400105041	1
400105042	25



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

Material	PBT-GF
Max. permitted radial offset	± 1.5 mm
Operating temp.	-40 ... +125°C

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

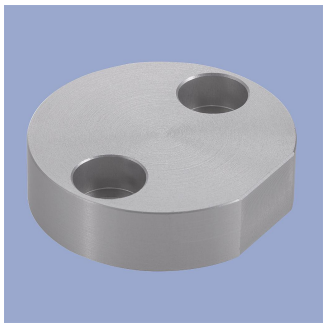


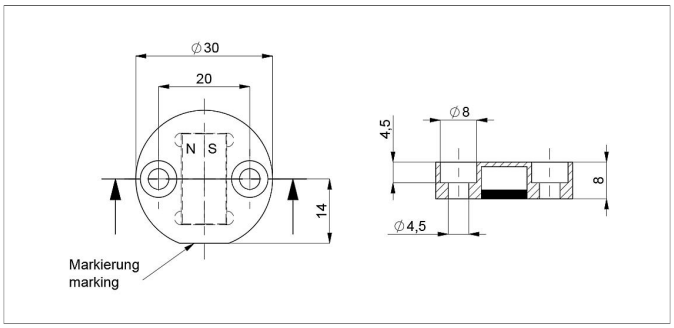
Z-RFC-P31
Position marker for frontal fixation with 2 cylinder screws M3x8 (included in delivery).

Material	PBT-GF
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

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

Position Markers

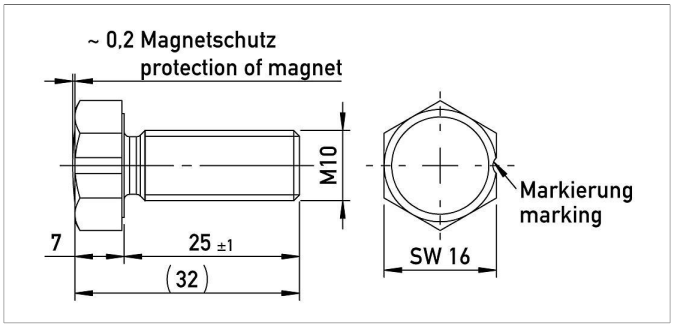




Z-RFC-P22
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock, included in delivery).
Attention: Closed side of position marker faces the active side of sensor.

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

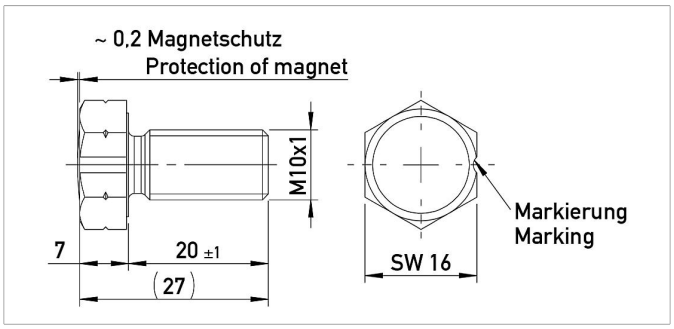
P/N	Pack. unit [pcs]
400106735	1
400106736	25



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

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

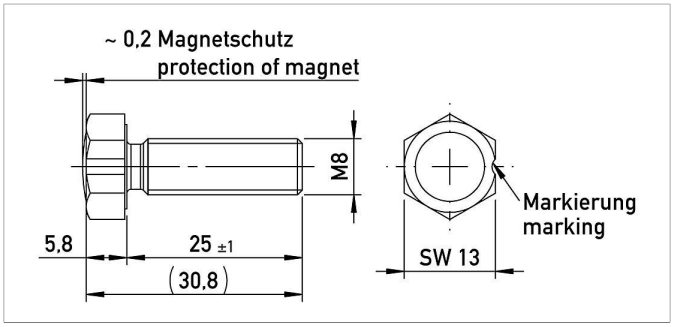
P/N	Pack. unit [pcs]
400104756	1
400104757	25



Z-RFC-P28
Screw position marker M10x1 x 20 mm, similar DIN 933, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

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

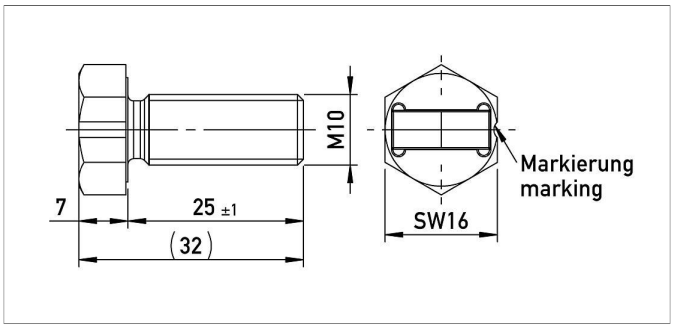


Z-RFC-P19
Screw position marker M8 x 25 mm, similar DIN 933/ISO 4017, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 1.5 mm
Operating temp.	-40 ... +125°C

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

Position Markers

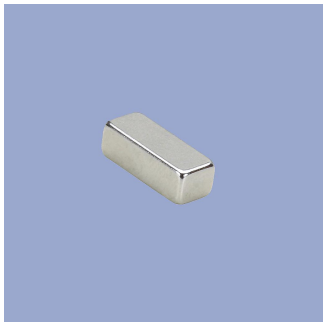


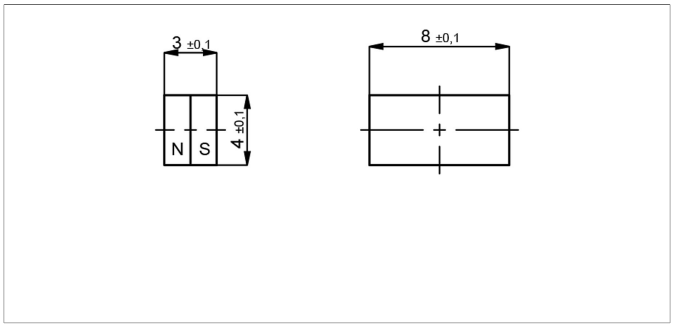
Z-RFC-P20

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



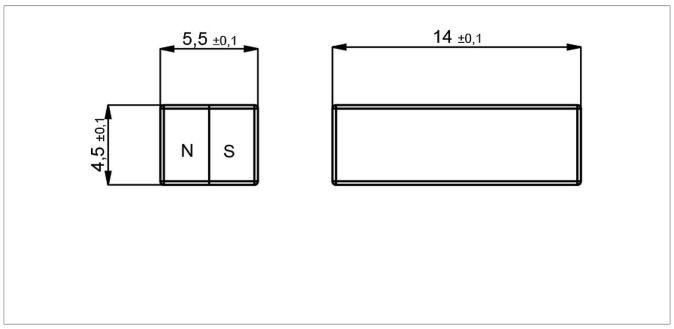


Z-RFC-P03

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

Position Markers

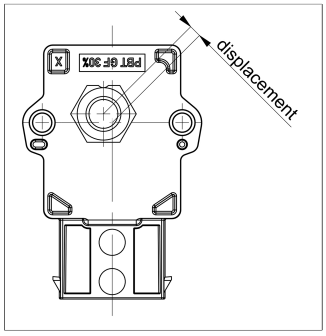
Working Distances Position Markers [mm] - One-channel Versions

Z-RFC-P03	Z-RFC-P04	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P20	Z-RFC-P22	Z-RFC-P23	Z-RFC-P30	Z-RFC-P31	Z-RFC-P43
0.4 ... 1.9	2 ... 4.7	0 ... 4	0 ... 1.8	2 ... 4.7	4.1 ... 8.9	2 ... 4.7	0.4 ... 1.9	2 ... 4.7	0 ... 2.4

Working Distances Position Markers [mm] - Redundant Versions

Z-RFC-P03	Z-RFC-P04	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P20	Z-RFC-P22	Z-RFC-P23	Z-RFC-P30	Z-RFC-P31	Z-RFC-P43
0... 1.5	1.6 ... 4.2	0 ... 3.5	0 ... 1.3	1.6 ... 4.2	3.6 ... 8.4	1.6 ... 4.2	0 ... 1.5	1.6 ... 4.2	0 ... 2

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.

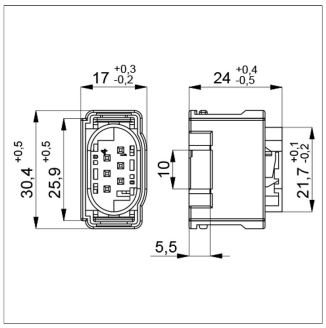
Additional Linearity Error at Radial Displacement - One-channel Versions

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: ±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 / P28	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°

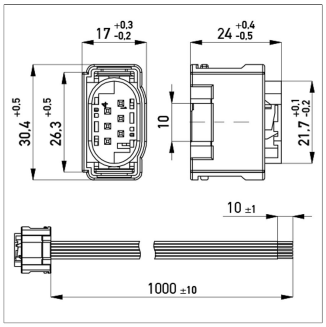
Connector System MQS

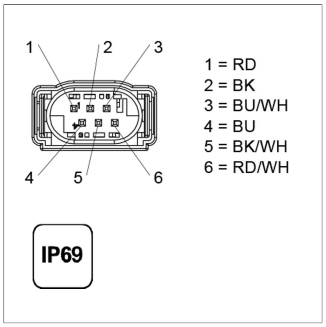


EEM-33-34
Connector kit MQS including
• 1 plug socket (female), PBT GF15, AMP P/N 1-967616-1
• 6 tinned contacts for cable cross-section area 0.25 ... 0.35 mm² (AWG 22), AMP-P/N 963727-1 or 5-962885-1
• 6 single conductor sealings AMP P/N 967067-2

Operating temp. -40 ... +120°C

P/N	Type
400005666	EEM-33-34





EEM-33-24
Connector MQS AMP P/N 1-967616-1, 6-pin, PBT GF15, with lead wires 0.5 mm², PVC, 1 m, open ended

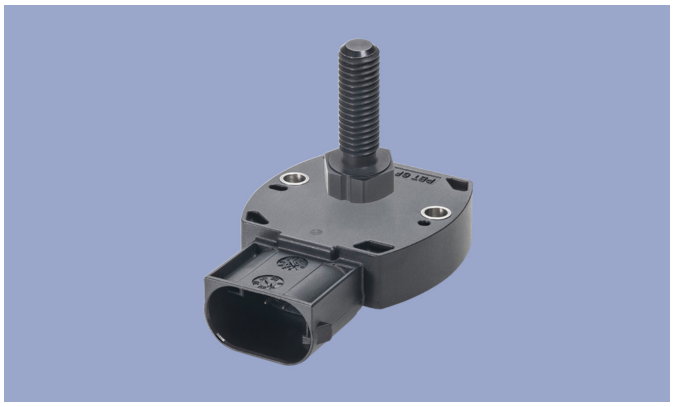
Operating temp. -40 ... +120°C
Lead wires PVC, 6x0.5 mm²

P/N	Type	Length
400108029	EEM-33-24	1 m

novotechnik
Siedle Group

NOVOHALL
Rotary Sensor
Touchless

RFE-3200
Voltage
Mobile Applications



Special Features
- Touchless hall technology
- Electrical range up to 360°
- 2 part design, mechanically decoupled
- High protection class IP67, IP68, IP69K
- Resolution up to 12 bit
- Wear-free
- Temperature range -40 °C to +125 °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

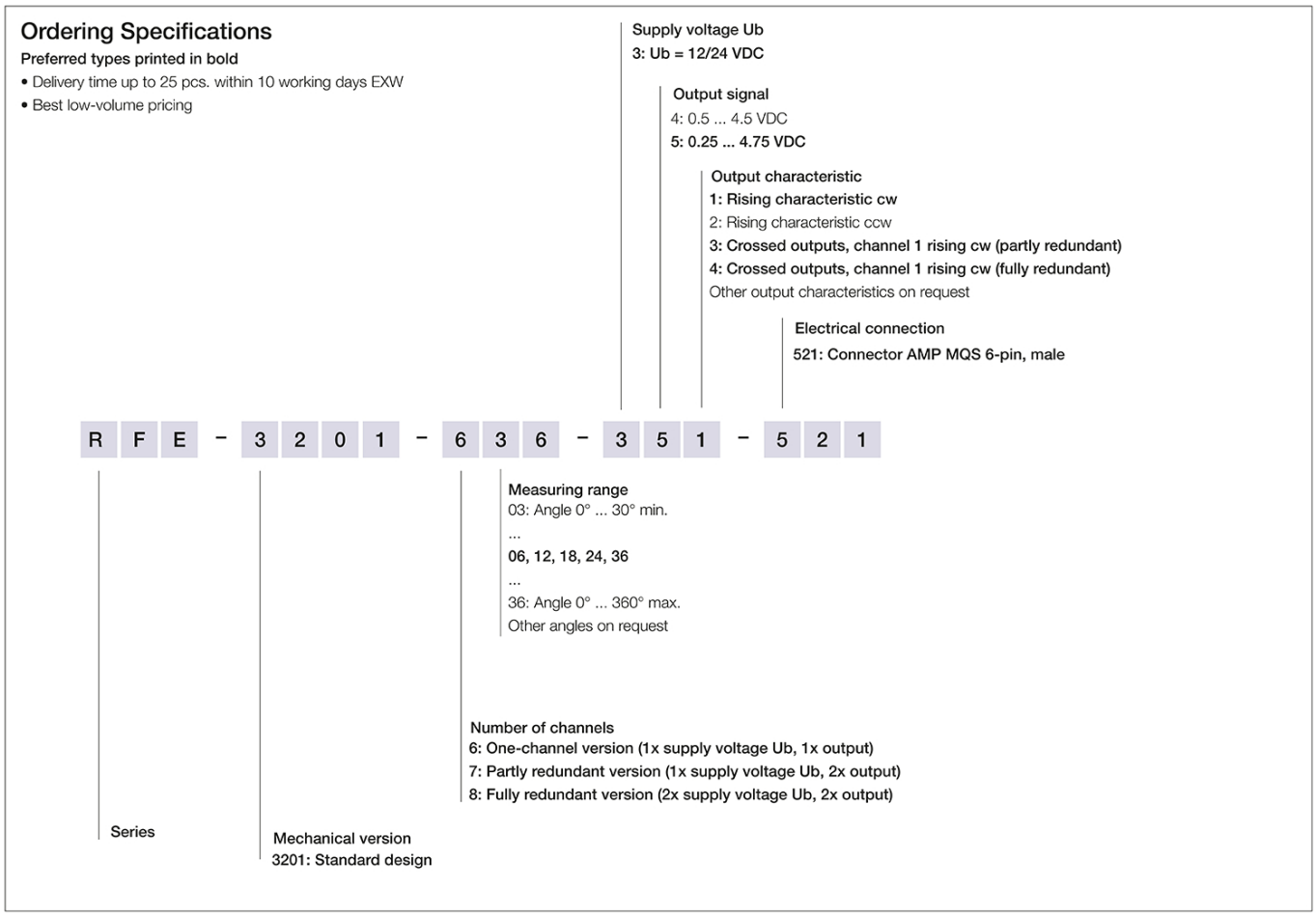
Applications
- Mobile working machines (industrial trucks, construction machinery, agricultural and forestry machinery)
- Marine applications

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 PBT GF30 with stainless steel inserts
Mounting	With 2 pan head screws M4x18 (included in delivery)
Fastening torque of mounting	max. 200 Ncm
Electrical connection	6-pin MQS-connector, code A, tinned contact according to drawing AMP-114-18063-126, Index A1 (Connector: AMP P/N 1-967616-1)

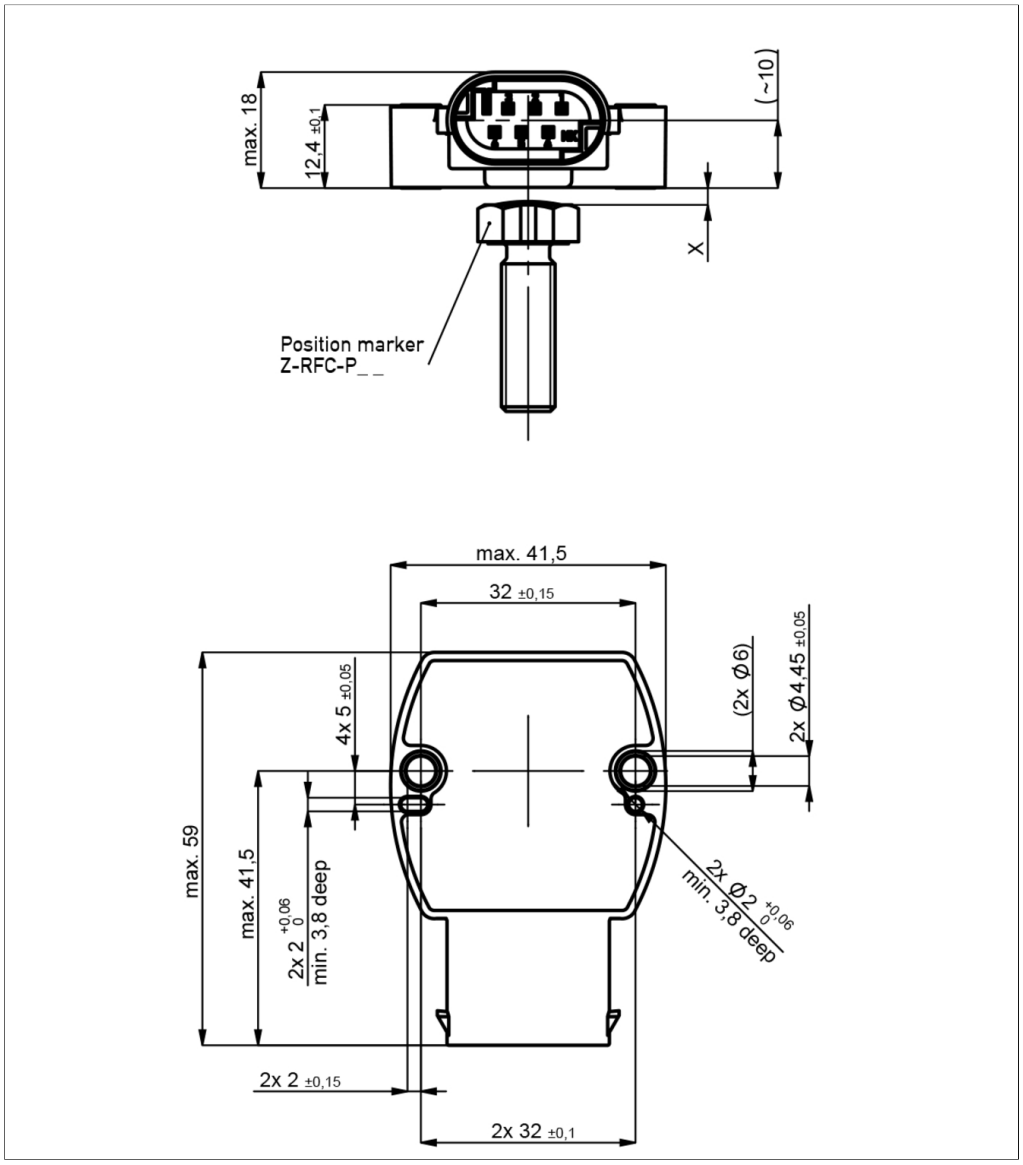
Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Weight	approx. 50 g

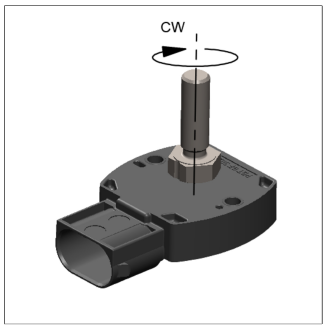
Ordering Specifications



Accessories included in delivery
• 2x Pan head screws M4x18

Drawing





When the marking of the position marker points towards the connector, the sensor is near the electrical center position (index position).

Technical Data

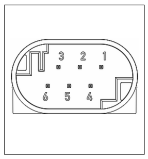
Type	**RFE-32_ _-_ _ _-3_ _-521**
	Analog voltage
Output signal	0.25 ... 4.75 V
	0.5 ... 4.5 V
Load	≥ 10 kΩ
Number of channels	1 / 2
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Update rate	typ. 3.4 kHz
Measuring range	0 ... 30° up to 0 ... 360° in 10°-steps
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. ±1.0 %FS, Measuring range ≥ 180°: typ. ±0.5 %FS
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Current consumption w/o load	typ. 12 mA per channel
Overvoltage protection	60 VDC (10 min.)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (vs. GND and supply voltage Ub)
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 ISO 20653	IP67 / IP68 / IP69K
Operating temperature	-40 ... +125°C*
	* The max. operating temperature depends on supply voltage Ub (see temp.diagram)
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)	766 years (one-channel), 488 years (partly redundant, per channel) or 383 years (fully redundant, per channel)
MTTFd (EN ISO 13849-1 parts count method, w/o load)	1533 years (one-channel), 977 years (partly redundant, per channel) or 767 years (fully redundant, per channel)
MTTFd-certificate	
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
Conformity/Approval	

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
ISO 7637-2 Transient Emissions	Level 3
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b, 4, 5) Level 4
ISO 7637-3 Pulses on output lines	Level 4
EN 13309 Construction machinery	
Emission/Immunity E1	acc. to ECE-R10
ISO 13766-1/-2 Construction machinery	Any multi-channel version

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

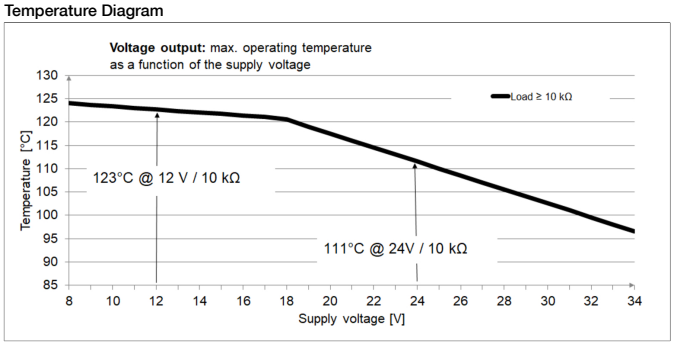
Connection Assignment

Signal	Connector code 5_ _	Connector code 5_ _	Connector code 5_ _
	One-channel	Partly redundant	Fully redundant
Supply voltage Ub 1	Pin 1	Pin 1	Pin 1
GND 1	Pin 2	Pin 2	Pin 2
Signal output 1	Pin 4	Pin 4	Pin 4
Signal output 2	-	Pin 3	Pin 3
Supply voltage Ub 2	-	-	Pin 6
GND 2	-	-	Pin 5
Not assigned	Pin 3, Pin 5, Pin 6	Pin 5, Pin 6	-

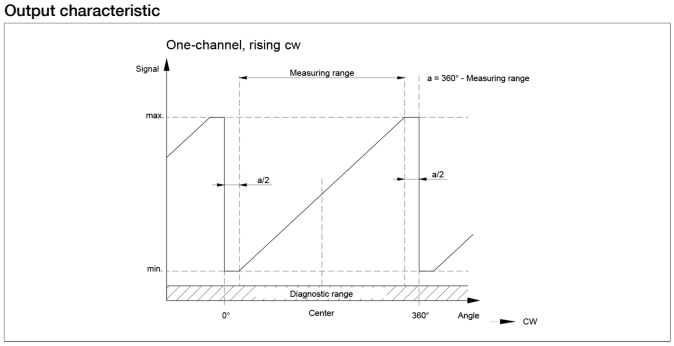


Technical Data
Output Characteristics

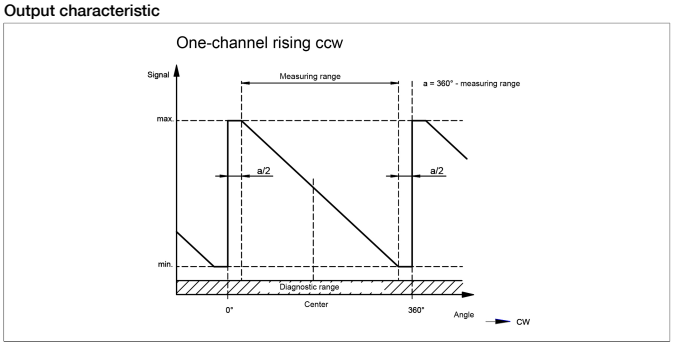
Temperature Diagram



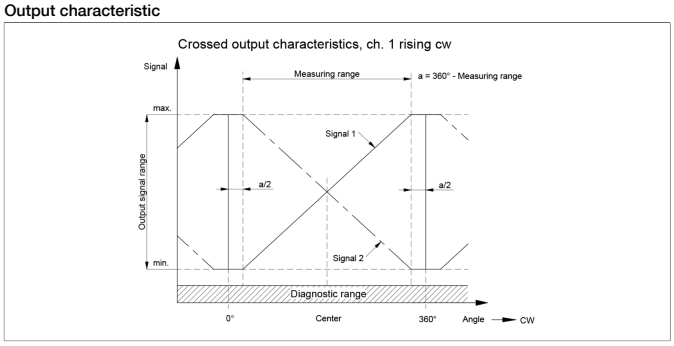
Output characteristic



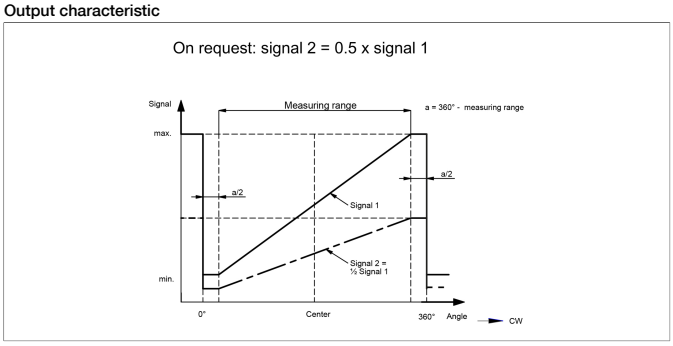
Output characteristic



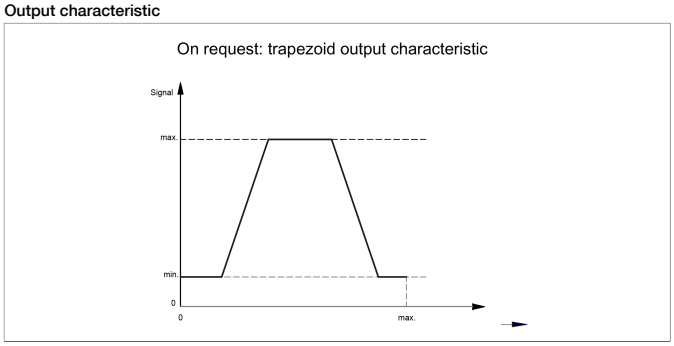
Output characteristic



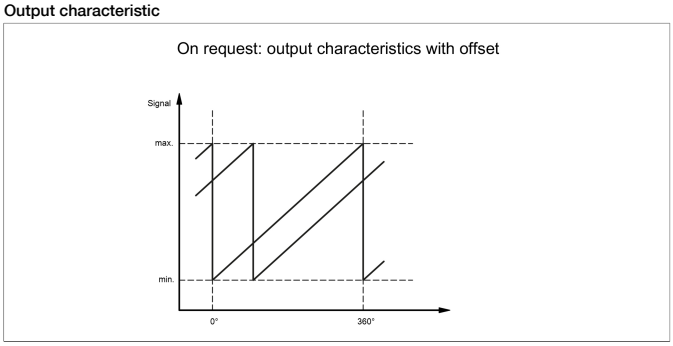
Output characteristic



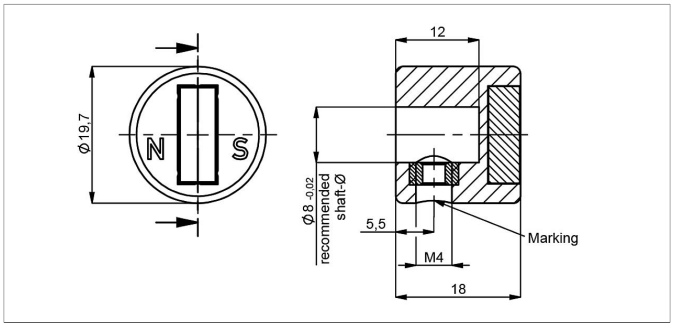
Output characteristic



Output characteristic



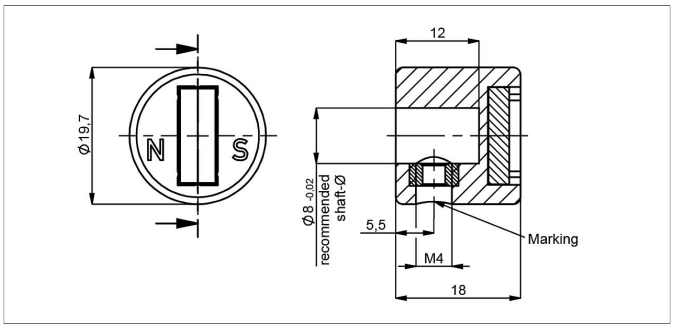
Position Markers



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
Operating temp.	-40 ... +125°C

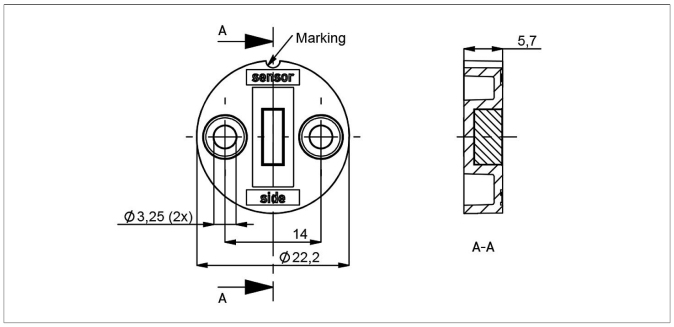
P/N	Pack. unit [pcs]
400056074	1
400056085	25



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 radial offset	± 3 mm
Operating temp.	-40 ... +125°C

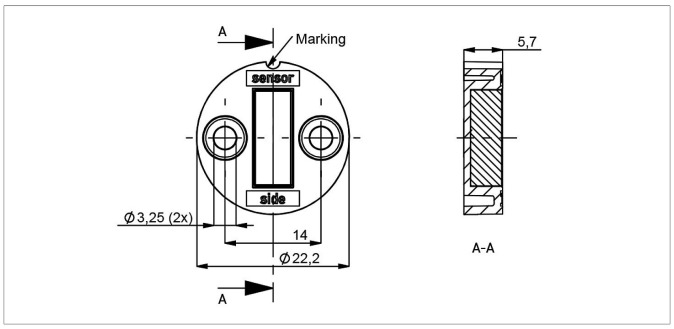
P/N	Pack. unit [pcs]
400105041	1
400105042	25



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

Material	PBT-GF
Max. permitted radial offset	± 1.5 mm
Operating temp.	-40 ... +125°C

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

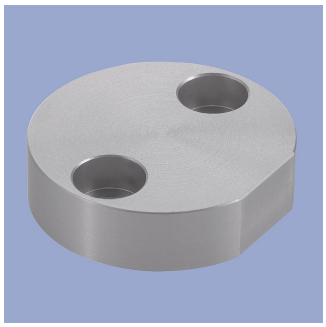


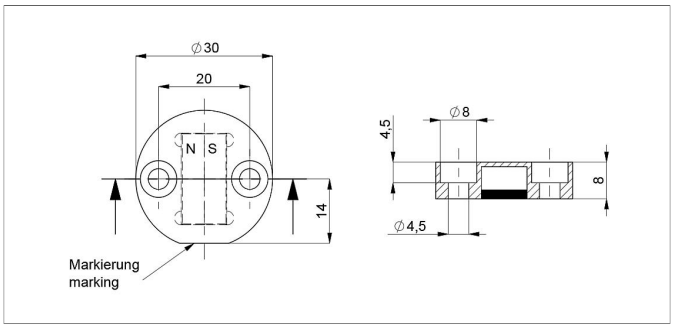
Z-RFC-P31
Position marker for frontal fixation with 2 cylinder screws M3x8 (included in delivery).

Material	PBT-GF
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

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

Position Markers

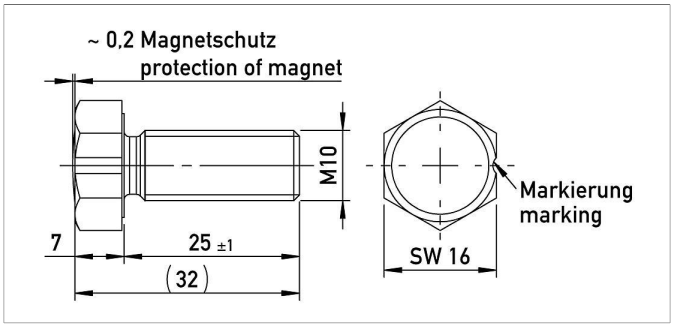




Z-RFC-P22
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock, included in delivery).
Attention: Closed side of position marker faces the active side of sensor.

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

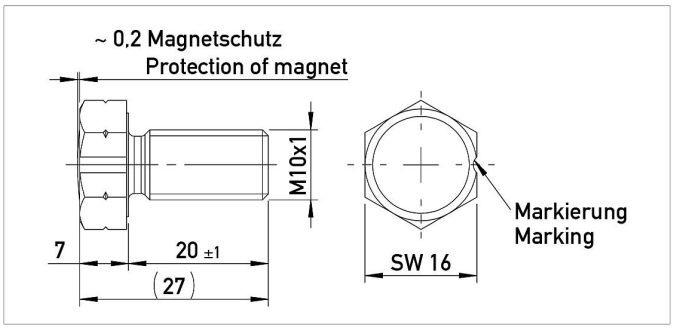
P/N	Pack. unit [pcs]
400106735	1
400106736	25



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

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

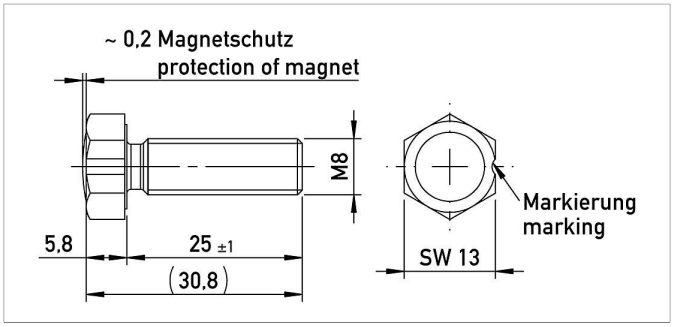
P/N	Pack. unit [pcs]
400104756	1
400104757	25



Z-RFC-P28
Screw position marker M10x1 x 20 mm, similar DIN 933, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 3 mm
Operating temp.	-40 ... +125°C

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

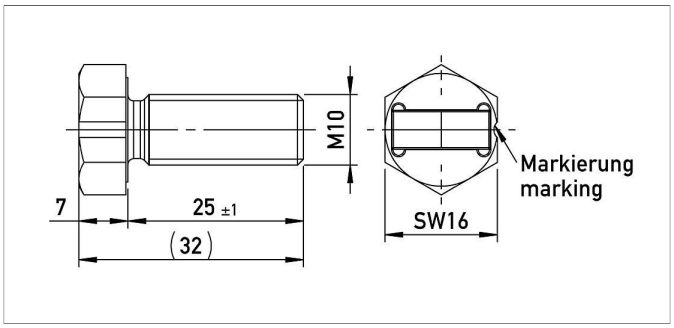


Z-RFC-P19
Screw position marker M8 x 25 mm, similar DIN 933/ISO 4017, magnet potted

Material	Aluminium, anodized
Max. permitted radial offset	± 1.5 mm
Operating temp.	-40 ... +125°C

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

Position Markers

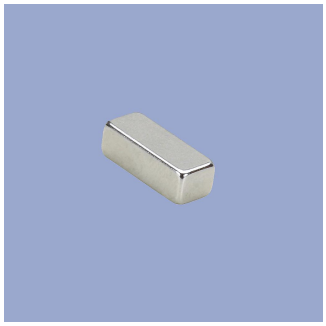


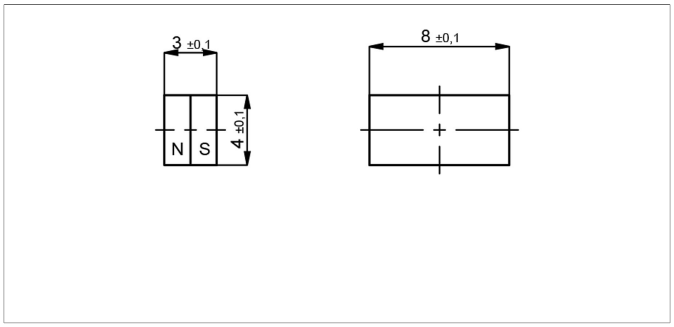
Z-RFC-P20

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



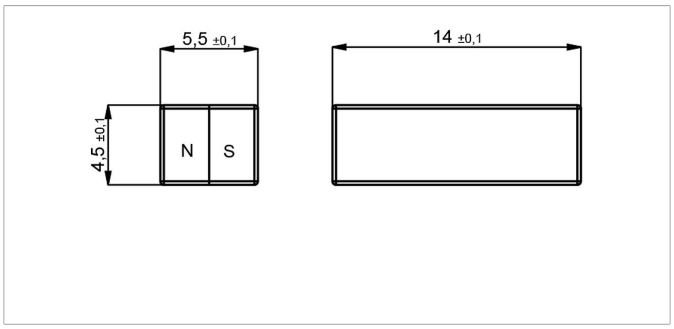


Z-RFC-P03

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

Position Markers

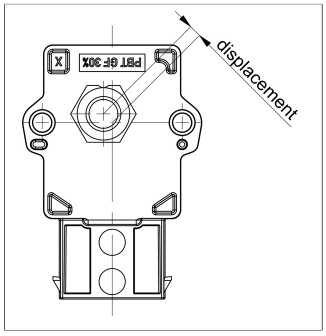
Working Distances Position Markers [mm] - One-channel Versions

Z-RFC-P03	Z-RFC-P04	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P20	Z-RFC-P22	Z-RFC-P23	Z-RFC-P30	Z-RFC-P31	Z-RFC-P43
0.4 ... 1.9	2 ... 4.7	0 ... 4	0 ... 1.8	2 ... 4.7	4.1 ... 8.9	2 ... 4.7	0.4 ... 1.9	2 ... 4.7	0 ... 2.4

Working Distances Position Markers [mm] - Redundant Versions

Z-RFC-P03	Z-RFC-P04	Z-RFC-P18 / P28	Z-RFC-P19	Z-RFC-P20	Z-RFC-P22	Z-RFC-P23	Z-RFC-P30	Z-RFC-P31	Z-RFC-P43
0... 1.5	1.6 ... 4.2	0 ... 3.5	0 ... 1.3	1.6 ... 4.2	3.6 ... 8.4	1.6 ... 4.2	0 ... 1.5	1.6 ... 4.2	0 ... 2

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.

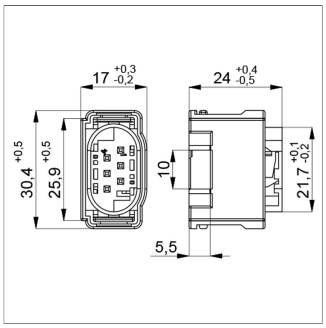
Additional Linearity Error at Radial Displacement - One-channel Versions

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: ±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 / P28	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°

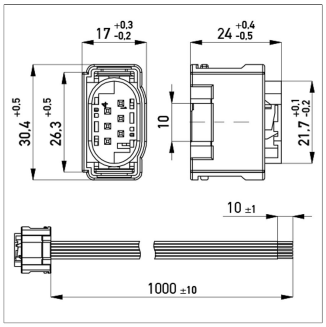
Connector System MQS

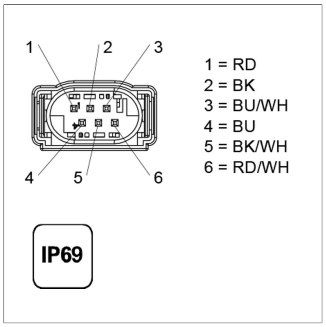


EEM-33-34
Connector kit MQS including
• 1 plug socket (female), PBT GF15, AMP P/N 1-967616-1
• 6 tinned contacts for cable cross-section area 0.25 ... 0.35 mm² (AWG 22), AMP-P/N 963727-1 or 5-962885-1
• 6 single conductor sealings AMP P/N 967067-2

Operating temp. -40 ... +120°C

P/N	Type
400005666	EEM-33-34





EEM-33-24
Connector MQS AMP P/N 1-967616-1, 6-pin, PBT GF15, with lead wires 0.5 mm², PVC, 1 m, open ended

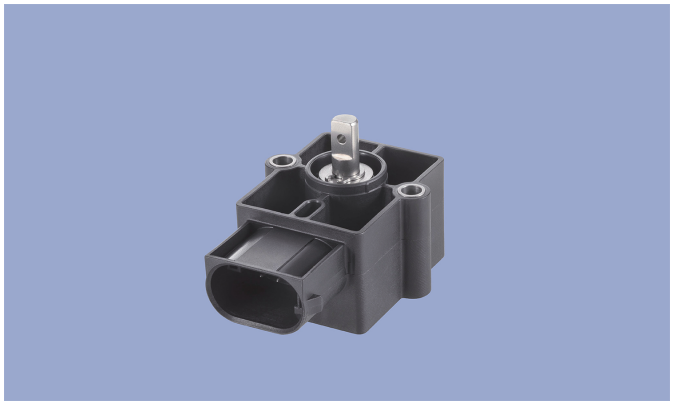
Operating temp. -40 ... +120°C
Lead wires PVC, 6x0.5 mm²

P/N	Type	Length
400108029	EEM-33-24	1 m

novotechnik
Siedle Group

NOVOHALL
Rotary Sensor
Non-contacting

RSA-3200
CAN SAE J1939
Mobile Applications



Special Features
- Touchless hall technology
- Electrical range 360°
- High protection class IP67 resp. IP69K (housing side)
- Resolution 14 bits
- 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, exceeds E1 requirements
- Suitable for linkage lever mounting
- Other configurations see separate data sheets

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

Mobile working machines or truck conveyors place very high demands on the sensor system due to the external application.
The very compact angle sensor RSA-3200 offers reliable function under harsh operating conditions.
The sensor is optimized for mobile applications and is certified according to the highest EMC standards such as ISO pulses and interference fields according to ISO 11452. Available are one and multi-channel versions.
The stainless steel shaft is designed for assembling of linkage levers.

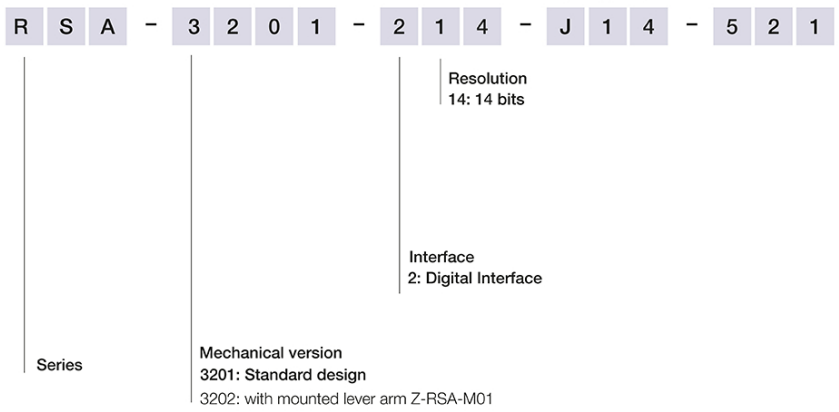
Description	
Material	Housing: high grade, temperature resistant plastic PBT-GF with stainless steel inserts Shaft: stainless steel, X10CrNiS18-9 1.4305 / AISI 303 Sealing: HNBR 70
Mounting	With 2 screws M4
Fastening torque of mounting	250 ± 50 Ncm
Bearing	Sintered bronze bushing
Sealing	Double O-ring seal, electronics completely encapsulated
Electrical connection	6-pin MQS-connector, code A, tinned contact according to drawing AMP-114-18063-126, Index A1 (Connector: AMP P/N 1-967616-1)

Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Permitted shaft load (static)	40 N (axial) / 50 N (radial)
Torque	Typ. 1.5 Ncm Depending on the environmental temperature and standstill time, the necessary force for the inital operating of the shaft may increase
Weight	approx. 45 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



Series

Mechanical version
3201: Standard design
3202: with mounted lever arm Z-RSA-M01

Interface
2: Digital Interface

Resolution
14: 14 bits

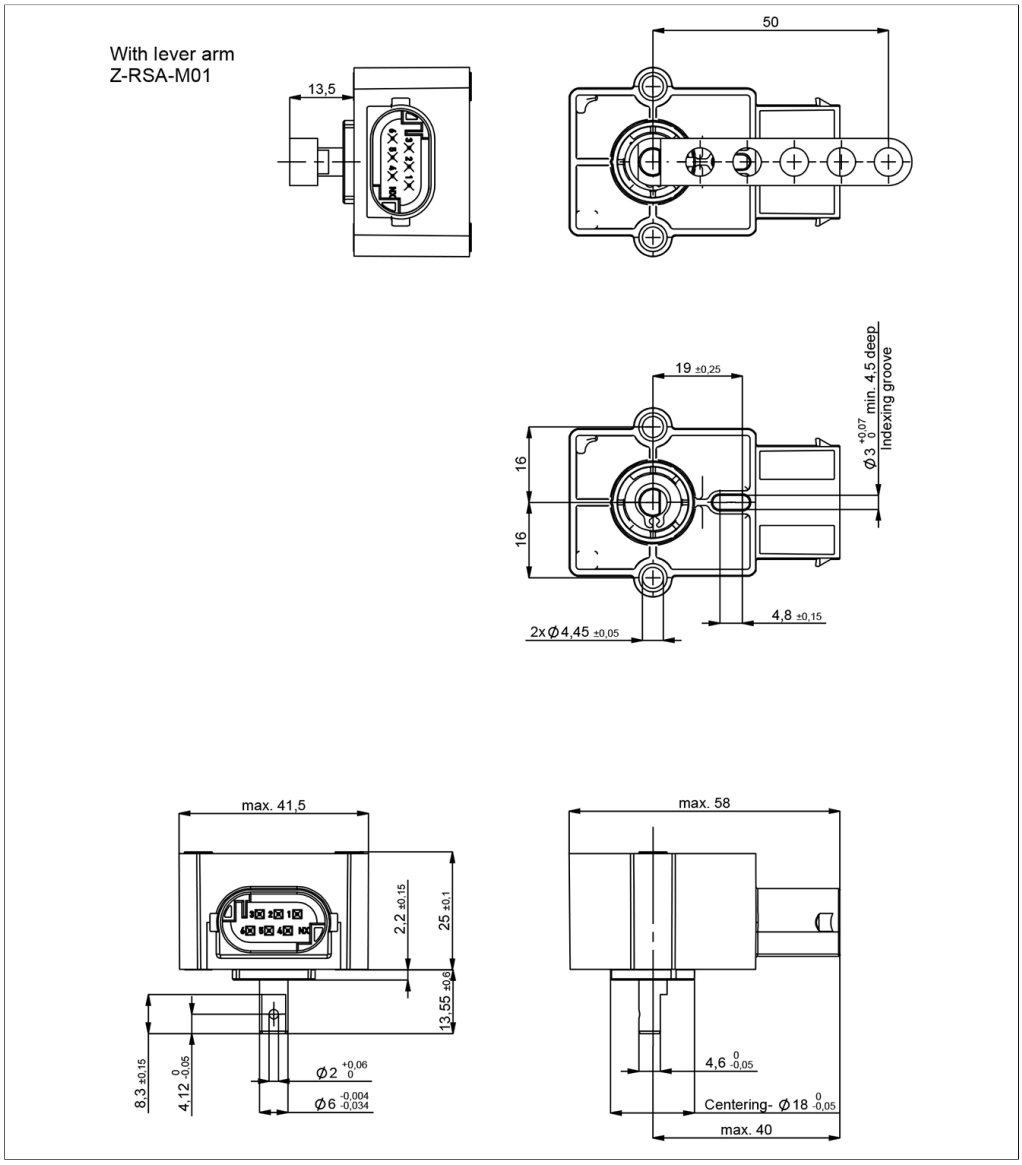
Interface
J: CAN SAE J1939

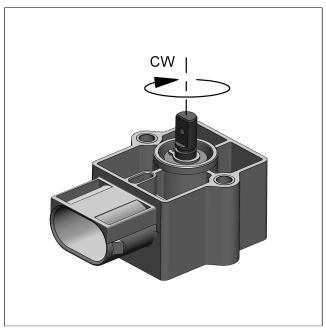
Interface parameters
One-channel version
1: 1x position, 1x speed, 1x revolution counter
5: 1x position, 1x speed, 1x revolution counter with bus termination 120 Ω
Two-channel version
2: 2x position, 2x speed
3: 2x position, 1x revolution counter
6: 2x position, 2x speed with bus termination 120 Ω
7: 2x position, 1x revolution counter with bus termination 120 Ω

Baud rate
3: 500 kBaud
4: 250 kBaud

Electrical connection
521: Connector AMP MQS 6-pin, male

Drawing





When the flattening of the shaft points towards the connector, the sensor is near the electrical center position.

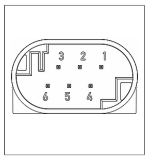
Technical Data

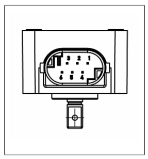
Type	**RSA-32_ _-214-J_ _-521** **CAN SAE J1939**
Measured variables	Position, speed, revolution counter
Measuring range	360°
Measuring range speed	0 ... 750 rpm
Number of channels	1 / 2
Protocol	CAN SAE J1939
Programmable parameters	Offset position, counting direction, averaging, baud rate, transmit mode, transmit cycle, source address, resolution position, resolution speed
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Node ID	128 ... 247 (dynamic address claiming)
Baud rate	250, 500 kBaud
Update rate (output)	1 kHz
Resolution	14 bits
Resolution speed	0.055°/s ... 2.2°/s
Linearity	1 Channel: ±0.5 %FS, 2 Channels: ±0.85 %FS
Repeatability	≤ ±0.1°
Hysteresis	≤ ±0.1°
Temperature error	±0.2 %FS
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Current consumption at Power-on	≤ 50 mA
Power drain w/o load	< 0.4 W
Overvoltage protection	45 VDC (permanent)
Polarity protection	yes (supply lines)
Short circuit protection	yes (output vs. GND and supply voltage up to 40 VDC)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	120 Ω (optionally)
Environmental Data	
Max. operational speed	120 rpm (temporary 800 rpm)
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 (shaft side), IP69K (housing incl. electronics)
Operating temperature	-40 ... +105°C
Operating humidity	0 ... 98 % R.H. (no condensation)
Life	typ. 30 Mio. movements (when operated without lever)
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	843 years (one-channel) or 819 years (two-channel, per channel)
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
ISO 11452-2 Radiated HF-fields	100 V/m
ISO 11452-4 BCI (Bulk current injection)	200 mA
CISPR 25 Radiated emission	Level 3
ISO 7637-2 Transient Emissions	Level 4
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b, 4, 5) Level 4
ISO 7637-3 Pulses on output lines	(3a, 3b) Fast Level 2, Slow Level 4
ISO 16750 Pulses on supply lines	Starting profile Level 4 @12 V / Level 3 @24 V
Emission/Immunity	Exceeds E1 requirements

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

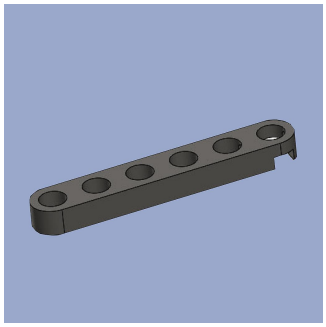
Connection Assignment

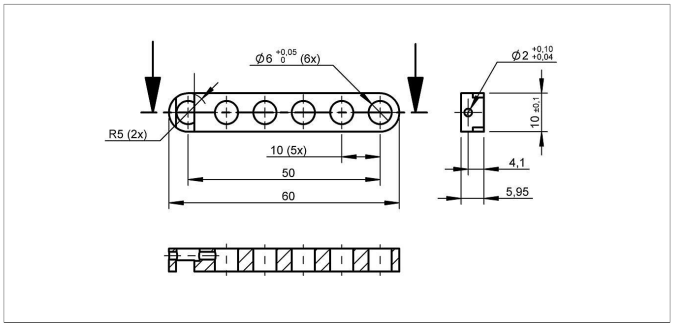
Signal	Connector code 5_ _
Supply voltage Ub	Pin 1
GND	Pin 2
CAN_H	Pin 3, pin 6
CAN_L	Pin 4, pin 5





Sensor Mounting



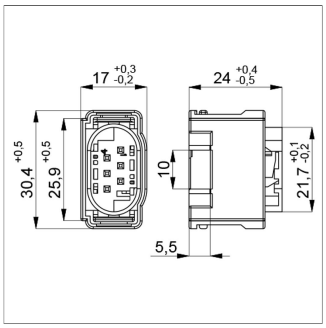


Z-RSA-M01
Lever arm 50 mm for mounting at shaft with locking pin (included in delivery).
Further levers (geometry, materials...) on request.

Material	Aluminium, anodized

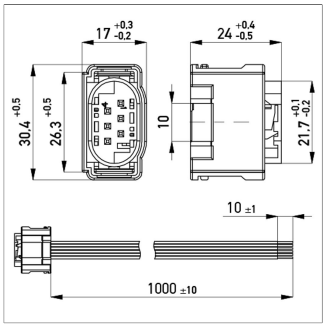
P/N	Type
400105062	Z-RSA-M01

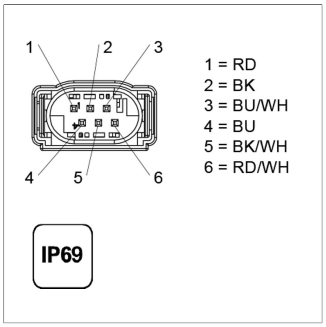
Connector System MQS



EEM-33-34
Connector kit MQS including
• 1 plug socket (female), PBT GF15, AMP P/N 1-967616-1
• 6 tinned contacts for cable cross-section area 0.25 ... 0.35 mm² (AWG 22), AMP-P/N 963727-1 or 5-962885-1
• 6 single conductor sealings AMP P/N 967067-2
Operating temp. -40 ... +120°C

P/N	Type
400005666	EEM-33-34





EEM-33-24
Connector MQS AMP P/N 1-967616-1, 6-pin, PBT GF15, with lead wires 0.5 mm², PVC, 1 m, open ended
Operating temp. -40 ... +120°C
Lead wires PVC, 6x0.5 mm²

P/N	Type	Length
400108029	EEM-33-24	1 m

novotechnik
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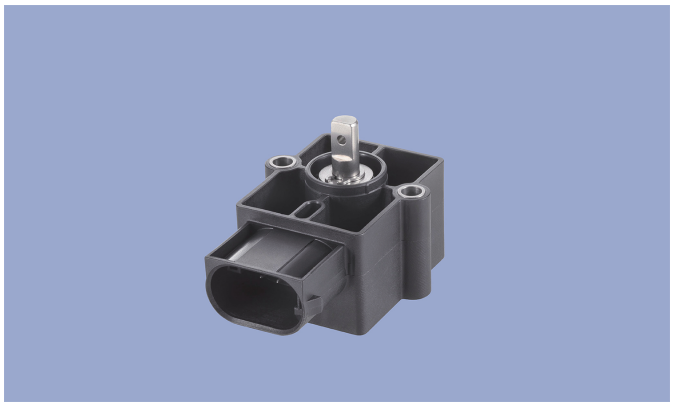
NOVOHALL
Rotary Sensor
Non-contacting

RSA-3200
CANopen
Mobile Applications



Special Features
- Touchless hall technology
- Electrical range 360°
- High protection class IP67 resp. IP69K (housing side)
- Resolution 14 bits
- 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, exceeds E1 requirements
- Suitable for linkage lever mounting
- Other configurations see separate data sheets

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

Mobile working machines or truck conveyors place very high demands on the sensor system due to the external application.
The very compact angle sensor RSA-3200 offers reliable function under harsh operating conditions.
The sensor is optimized for mobile applications and is certified according to the highest EMC standards such as ISO pulses and interference fields according to ISO 11452. Available are one and multi-channel versions.
The stainless steel shaft is designed for assembling of linkage levers.

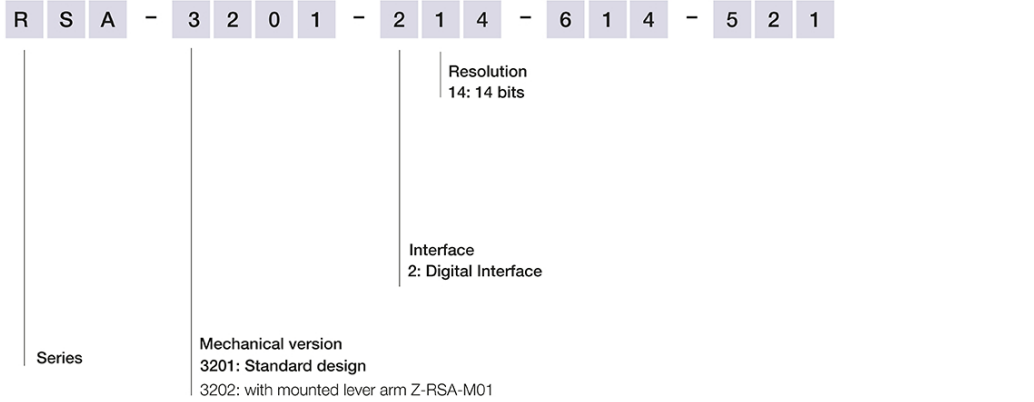
Description	
Material	Housing: high grade, temperature resistant plastic PBT-GF with stainless steel inserts Shaft: stainless steel, X10CrNiS18-9 1.4305 / AISI 303 Sealing: HNBR 70
Mounting	With 2 screws M4
Fastening torque of mounting	250 ± 50 Ncm
Bearing	Sintered bronze bushing
Sealing	Double O-ring seal, electronics completely encapsulated
Electrical connection	6-pin MQS-connector, code A, tinned contact according to drawing AMP-114-18063-126, Index A1 (Connector: AMP P/N 1-967616-1)

Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Permitted shaft load (static)	40 N (axial) / 50 N (radial)
Torque	Typ. 1.5 Ncm Depending on the environmental temperature and standstill time, the necessary force for the inital operating of the shaft may increase
Weight	approx. 45 g

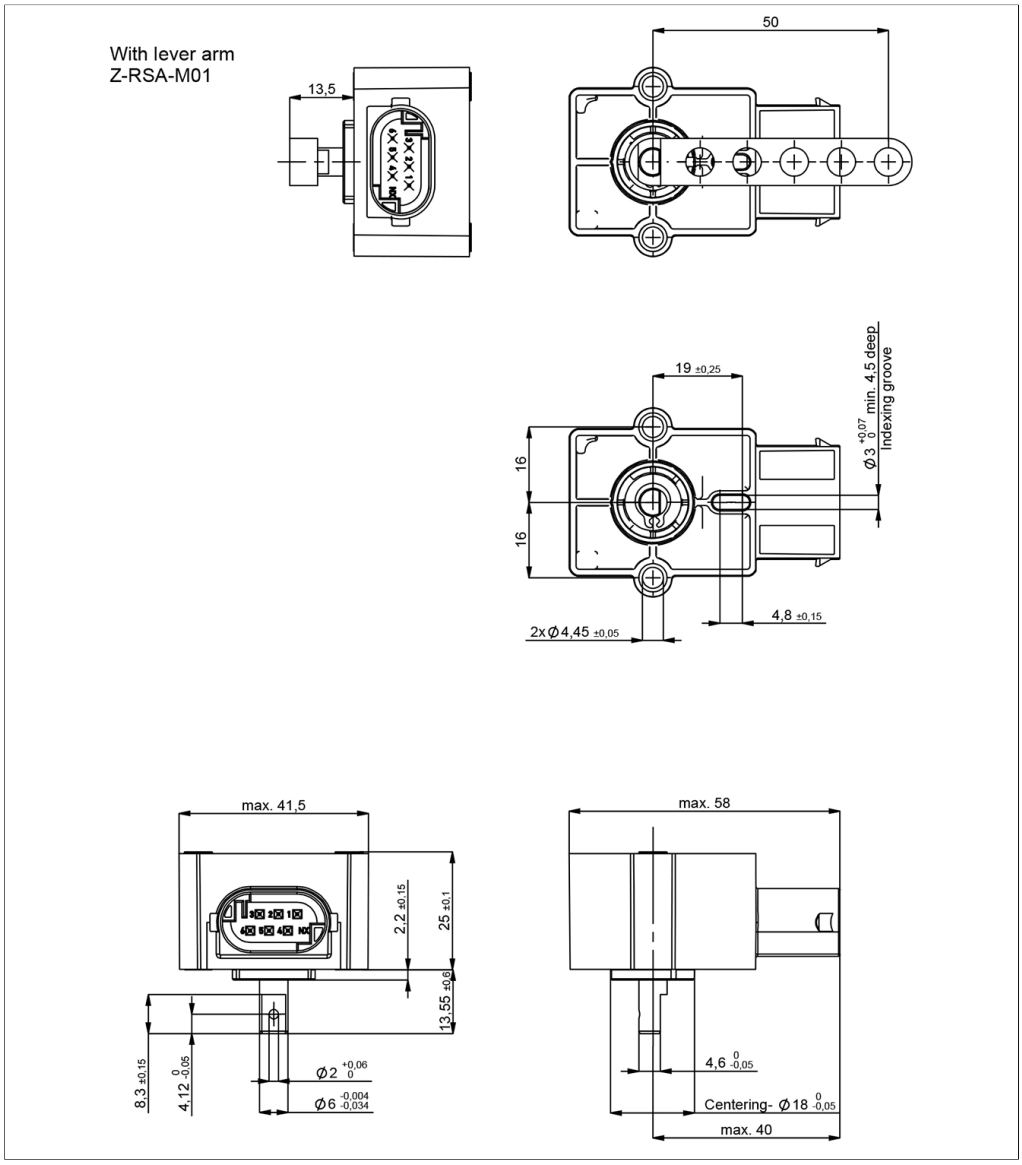
Ordering Specifications

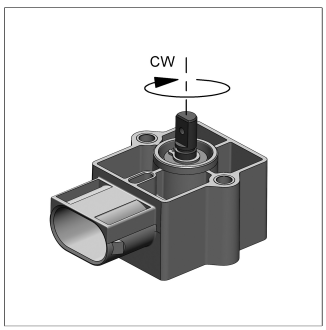
Ordering Specifications

Preferred types printed in bold
- Delivery time up to 25 pcs. within 10 working days EXW
- Best low-volume pricing



Drawing





When the flattening of the shaft points towards the connector, the sensor is near the electrical center position.

Technical Data

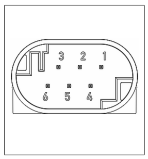
CANopen

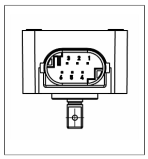
Type	**RSA-32_ _-214-6_ _-521**
	CANopen
Measured variables	Position and speed
Measuring range	360°
Number of channels	1 / 2
Protocol	CANopen protocol to CiA DS-301 V4.2.0, Device profile DS-406 V3.2 Encoder Class C2, LSS services to CiA DS-305 V1.1.2
Programmable parameters	Position, speed, cams, working areas, rotating direction, scale, offset, node ID, baud rate
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Node ID	1 ... 127 (default 127)
Baud rate	50 ... 1000 kBaud
Update rate (output)	1 kHz
Resolution	14 bits
Resolution speed	360°/2^14 ≈ 0.022°/ms
Absolute linearity	1 Channel: ±0.5 %FS, 2 Channels: ±0.85 %FS
Repeatability	≤ ±0.1°
Hysteresis	≤ ±0.1°
Temperature error	±0.2 %FS
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Current consumption at Power-on	≤ 50 mA
Power drain w/o load	< 0.4 W
Overvoltage protection	45 VDC (permanent)
Polarity protection	yes (supply lines)
Short circuit protection	yes (output vs. GND and supply voltage up to 40 VDC)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	120 Ω (optionally)
Environmental Data	
Max. operational speed	120 rpm (temporary 800 rpm)
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 (shaft side), IP69K (housing incl. electronics)
Operating temperature	-40 ... +105°C
Operating humidity	0 ... 98 % R.H. (no condensation)
Life	typ. 30 Mio. movements (when operated without lever)
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	843 years (one-channel) or 819 years (two-channel, per channel)
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
ISO 11452-2 Radiated HF-fields	100 V/m
ISO 11452-5 Radiated HF-Fields, stripline	200 V/m
CISPR 25 Radiated emission	Level 3
ISO 7637-2 Transient Emissions	Level 3
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b, 4, 5) Level 4
ISO 7637-3 Pulses on output lines	Level 4
ISO 16750 Pulses on supply lines	Starting profile Level 4 @12 V / Level 3 @24 V
Emission/Immunity	Exceeds E1 requirements

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

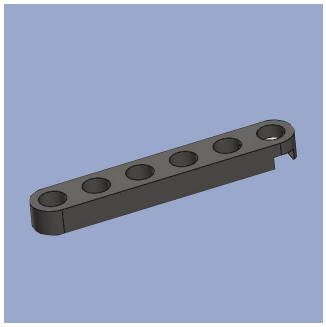
Connection Assignment

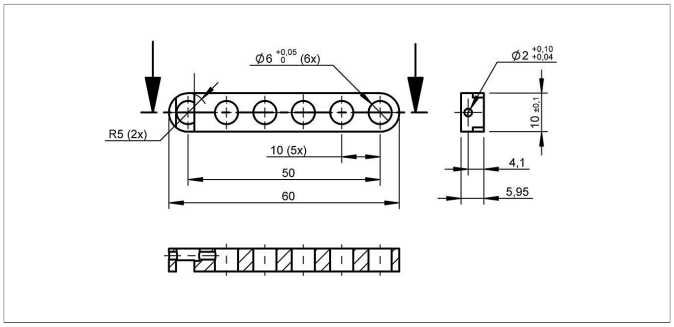
Signal	Connector code 5_ _
Supply voltage Ub	Pin 1
GND	Pin 2
CAN_H	Pin 3, pin 6
CAN_L	Pin 4, pin 5





Sensor Mounting



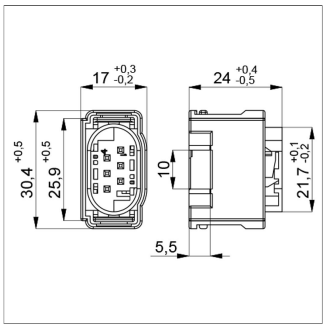


Z-RSA-M01
Lever arm 50 mm for mounting at shaft with locking pin (included in delivery).
Further levers (geometry, materials...) on request.

Material	Aluminium, anodized

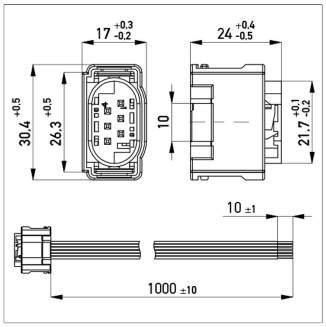
P/N	Type
400105062	Z-RSA-M01

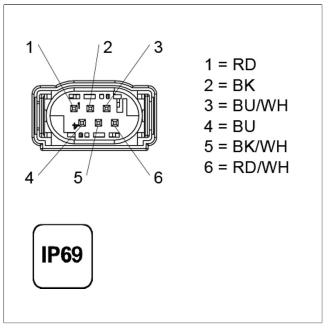
Connector System MQS



EEM-33-34
Connector kit MQS including
• 1 plug socket (female), PBT GF15, AMP P/N 1-967616-1
• 6 tinned contacts for cable cross-section area 0.25 ... 0.35 mm² (AWG 22), AMP-P/N 963727-1 or 5-962885-1
• 6 single conductor sealings AMP P/N 967067-2
Operating temp. -40 ... +120°C

P/N	Type
400005666	EEM-33-34





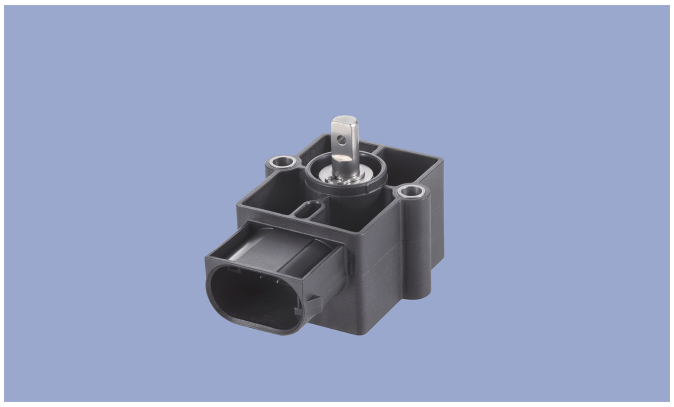
EEM-33-24
Connector MQS AMP P/N 1-967616-1, 6-pin, PBT GF15, with lead wires 0.5 mm², PVC, 1 m, open ended
Operating temp. -40 ... +120°C
Lead wires PVC, 6x0.5 mm²

P/N	Type	Length
400108029	EEM-33-24	1 m

novotechnik
Siedle Group

NOVOHALL
Rotary Sensor
Non-contacting

RSA-3200
Ratiometric
Mobile Applications



Special Features
- Contactless hall technology
- Electrical range up to 360°
- High protection class IP67 rep. IP69K (housing side)
- Resolution up to 12 bit
- Temperature range -40°C to +125°C
- One and multi-channel versions
- Optimized for use in mobile applications
- For highest EMC requirements such as interference fields according to ISO 11452 and ECE directive
- Suitable for safety-related applications according to DIN EN ISO 13849
- Suitable for linkage lever mounting
- Other configurations see separate data sheets

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

Mobile working machines or truck conveyors place very high demands on the sensor system due to the external application.
The very compact angle sensor RSA-3200 offers reliable function under harsh operating conditions.
The sensor is optimized for mobile applications and is certified according to the highest EMC standards such as interference fields according to ISO 11452.
Available are one and multi-channel versions which are suitable for use in safety-related applications. The stainless steel shaft is designed for assembling of lever arms.

Description	
Material	Housing: high grade, temperature resistant plastic PBT-GF with stainless steel inserts Shaft: stainless steel, X10CrNiS18-9 1.4305 / AISI 303 Sealing: HNBR 70
Mounting	With 2 screws M4
Fastening torque of mounting	250 ± 50 Ncm
Bearing	Sintered bronze bushing
Sealing	Double O-ring seal, electronics completely encapsulated
Electrical connection	6-pin MQS-connector, code A, tinned contact according to drawing AMP-114-18063-126, Index A1 (Connector: AMP P/N 1-967616-1)

Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Permitted shaft load (static)	40 N (axial) / 50 N (radial)
Torque	Typ. 1.5 Ncm Depending on the environmental temperature and standstill time, the necessary force for the inital operating of the shaft may increase
Weight	approx. 45 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
521: Connector AMP MQS 6-pin, male

R	S	A	–	3	2	0	1	–	6	3	6	–	2	1	1	–	5	2	1

Measuring range
03: Angle 0° ... 30° min.
...
06, 12, 18, 24, 36
...
36: Angle 0° ... 360° max.
Other angles on request

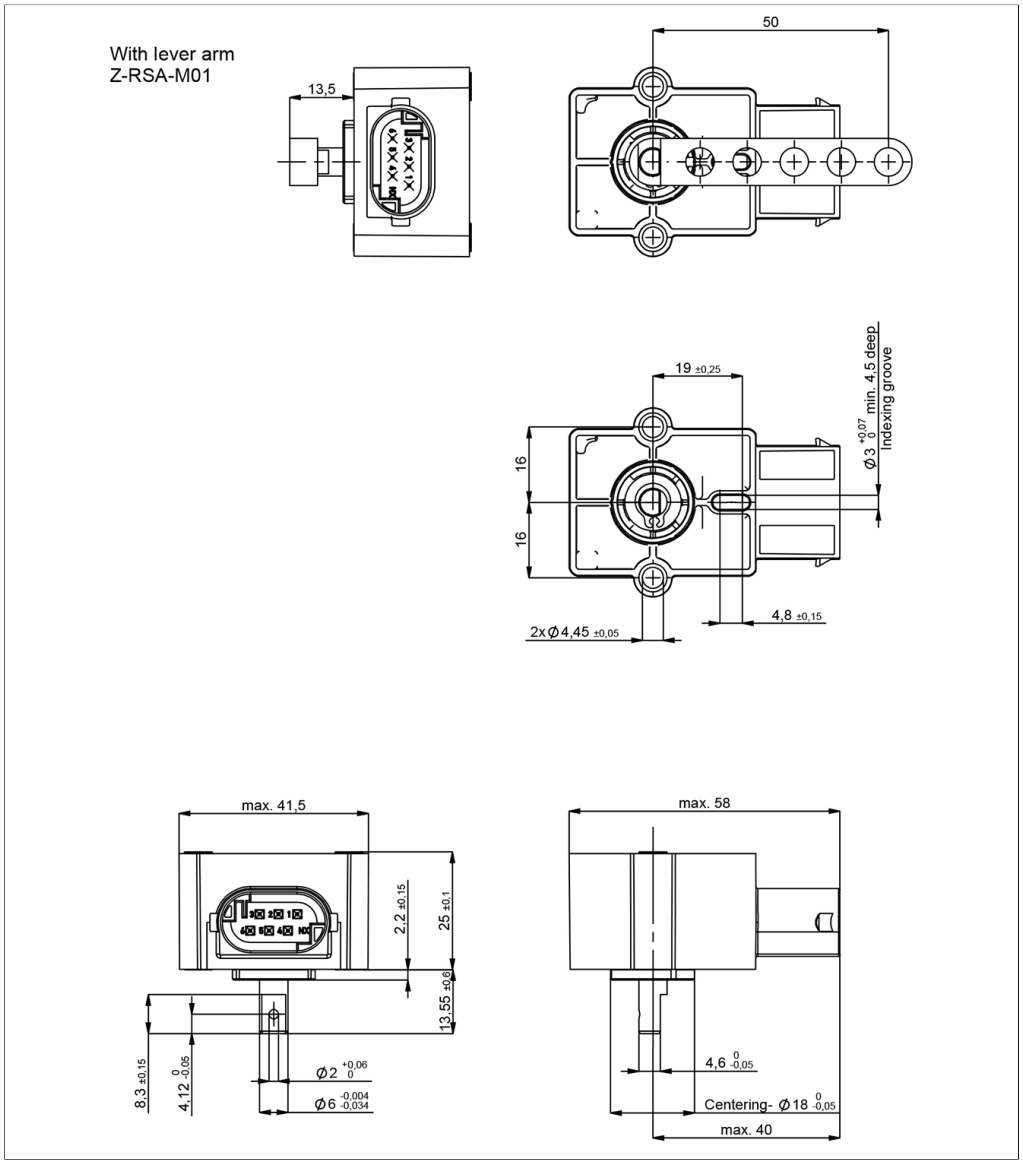
Number of channels
6: One-channel version (1x supply voltage Ub, 1x output)
7: Partly redundant version (1x supply voltage Ub, 2x output)
8: Fully redundant version (2x supply voltage Ub, 2x output)

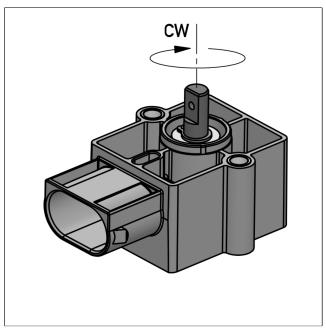
Mechanical version
Output characteristic A (standard)
3201: Standard design
3202: with mounted lever arm Z-RSA-M01

Output characteristic B (180° offset)
3221: Standard design
3222: with mounted lever arm Z-RSA-M01

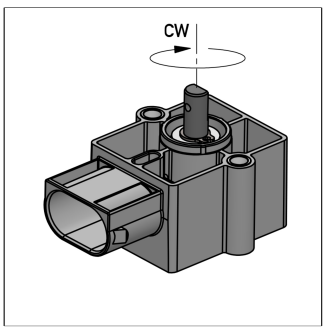
Series

Drawing





Output characteristic A
(standard)
RSA-3201/3202:
When the flattening of the shaft or the lever arm points towards the connector, the sensor is near the electrical center position.



Output characteristic B
(180° offset)
RSA-3221/3222:
When the flattening of the shaft or the lever arm is located opposite to the connector, the sensor is near the electrical center position.

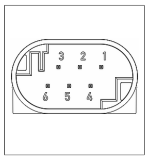
Technical Data

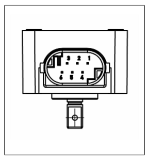
Type	**RSA-32_ _-_ _ _-2_ _-521**
Output signal	ratiometric to supply voltage Ub 5 ... 95% (0.25 ... 4.75 V) 10 ... 90% (0.5 ... 4.5 V)
Load	≥ 5 kΩ
Number of channels	1 / 2
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Update rate	typ. 3.4 kHz
Measuring range	0 ... 30° up to 0 ... 360° in 10°-steps
Absolute linearity at measuring range	360°: ≤ ±0.4 %FS, 240°: ≤ ±0.45 %FS, 180°: ≤ ±0.5 %FS, 120°: ≤ ±0.55 %FS, 60°: ≤ ±0.8 %FS, 30°: ≤ ±1.25 %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 < 180°: 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
Overvoltage protection	24 VDC (60 min.)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (vs. GND and supply voltage Ub)
Insulation resistance (500 VDC)	≥ 10 MΩ
Environmental Data	
Max. operational speed	120 rpm (temporary 800 rpm)
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 ISO 20653	IP67 (shaft side), IP69K (housing incl. electronics)
Operating temperature	-40 ... +125°C
Operating humidity	0 ... 98 % R.H. (no condensation)
Life	typ. 30 Mio. movements (when operated without lever)
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	
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

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

Connection Assignment

	One-channel	Partly redundant	Fully redundant
Supply voltage Ub 1	Pin 1	Pin 1 / Pin 6	Pin 1
GND 1	Pin 2	Pin 2 / Pin 5	Pin 2
Signal output 1	Pin 4	Pin 4	Pin 4
Signal output 2	-	Pin 3	Pin 3
Supply voltage Ub 2	-	-	Pin 6
GND 2	-	-	Pin 5
Not assigned	Pin 3, Pin 5, Pin 6	-	-

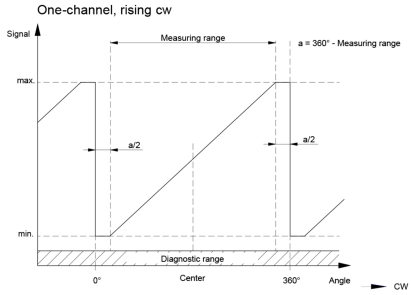




Technical Data
Output Characteristics

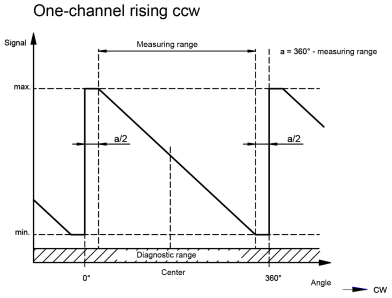
Output characteristic

One-channel, rising cw



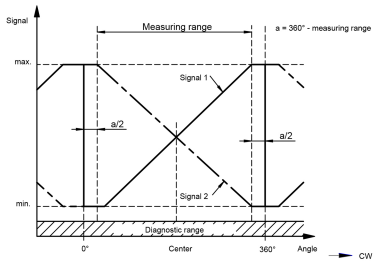
Output characteristic

One-channel rising ccw



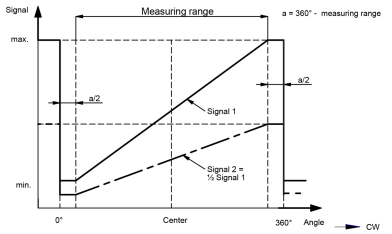
Output characteristic

Crossed output characteristics, ch. 1 rising cw



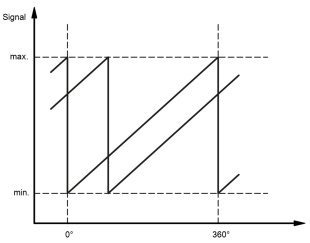
Output characteristic

On request: signal 2 = 0.5 x signal 1



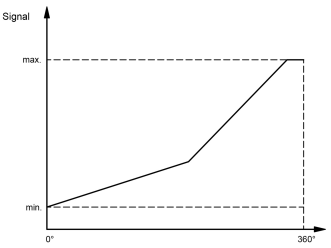
Output characteristic

On request: output characteristics with offset



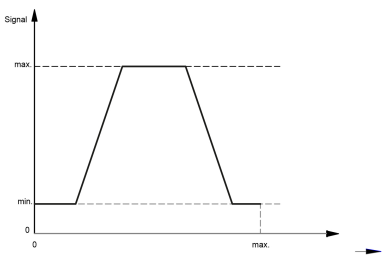
Output characteristic

On request: different gradients



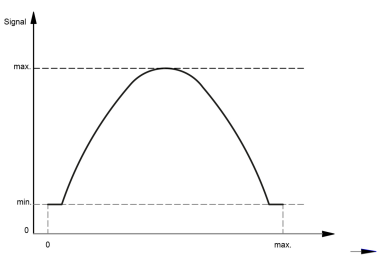
Output characteristic

On request: trapezoid output characteristic

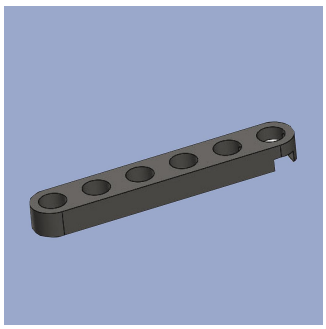


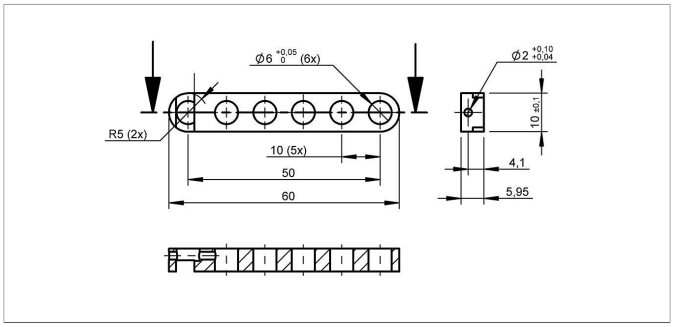
Output characteristic

On request: parabolic output characteristic



Sensor Mounting



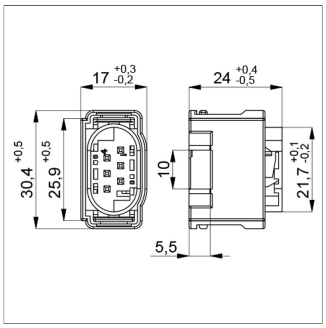


Z-RSA-M01
Lever arm 50 mm for mounting at shaft with locking pin (included in delivery).
Further levers (geometry, materials...) on request.

Material	Aluminium, anodized

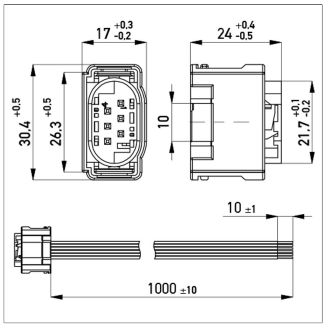
P/N	Type
400105062	Z-RSA-M01

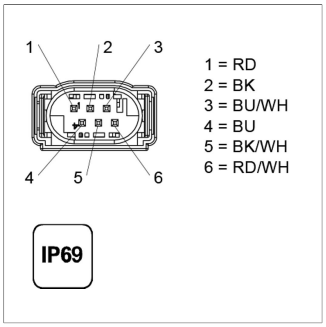
Connector System MQS



EEM-33-34
Connector kit MQS including
• 1 plug socket (female), PBT GF15, AMP P/N 1-967616-1
• 6 tinned contacts for cable cross-section area 0.25 ... 0.35 mm² (AWG 22), AMP-P/N 963727-1 or 5-962885-1
• 6 single conductor sealings AMP P/N 967067-2
Operating temp. -40 ... +120°C

P/N	Type
400005666	EEM-33-34





EEM-33-24
Connector MQS AMP P/N 1-967616-1, 6-pin, PBT GF15, with lead wires 0.5 mm², PVC, 1 m, open ended
Operating temp. -40 ... +120°C
Lead wires PVC, 6x0.5 mm²

P/N	Type	Length
400108029	EEM-33-24	1 m

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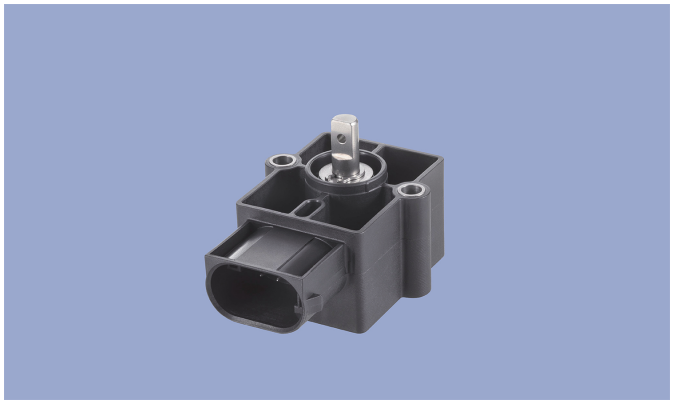
NOVOHALL
Rotary Sensor
Non-contacting

RSA-3200
4 ... 20 mA
Mobile Applications



Special Features
- Contactless hall technology
- Electrical range up to 360°
- High protection class IP67 rep. IP69K (housing side)
- Resolution up to 12 bits
- Temperature range -40°C to +105°C
- One and multi-channel versions
- Optimized for use in mobile applications
- For highest EMC requirements such as ISO pulses and interference fields according to ISO 11452 and ECE directive
- Suitable for safety-related applications according to DIN EN ISO 13849
- Suitable for linkage lever mounting
- Other configurations see separate data sheets

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

Mobile working machines or truck conveyors place very high demands on the sensor system due to the external application.
The very compact angle sensor RSA-3200 offers reliable function under harsh operating conditions.
The sensor is optimized for mobile applications and is certified according to the highest EMC standards such as ISO pulses and interference fields according to ISO 11452.
Available are one and multi-channel versions which are suitable for use in safety-related applications. The stainless steel shaft is designed for assembling of lever arms.

Description	
Material	Housing: high grade, temperature resistant plastic PBT-GF with stainless steel inserts Shaft: stainless steel, X10CrNiS18-9 1.4305 / AISI 303 Sealing: HNBR 70
Mounting	With 2 screws M4
Fastening torque of mounting	250 ± 50 Ncm
Bearing	Sintered bronze bushing
Sealing	Double O-ring seal, electronics completely encapsulated
Electrical connection	6-pin MQS-connector, code A, tinned contact according to drawing AMP-114-18063-126, Index A1 (Connector: AMP P/N 1-967616-1)

Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Permitted shaft load (static)	40 N (axial) / 50 N (radial)
Torque	Typ. 1.5 Ncm Depending on the environmental temperature and standstill time, the necessary force for the inital operating of the shaft may increase
Weight (w/o connection)	approx. 45 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
3: Ub = 12/24 VDC

Output signal
2: 4 ... 20 mA

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
521: Connector AMP MQS 6-pin, male

R S A - 3 2 0 1 - 6 3 6 - 3 2 1 - 5 2 1

Measuring range
03: Angle 0° ... 30° min.
...
06, 12, 18, 24, 36
...
36: Angle 0° ... 360° max.
Other angles on request

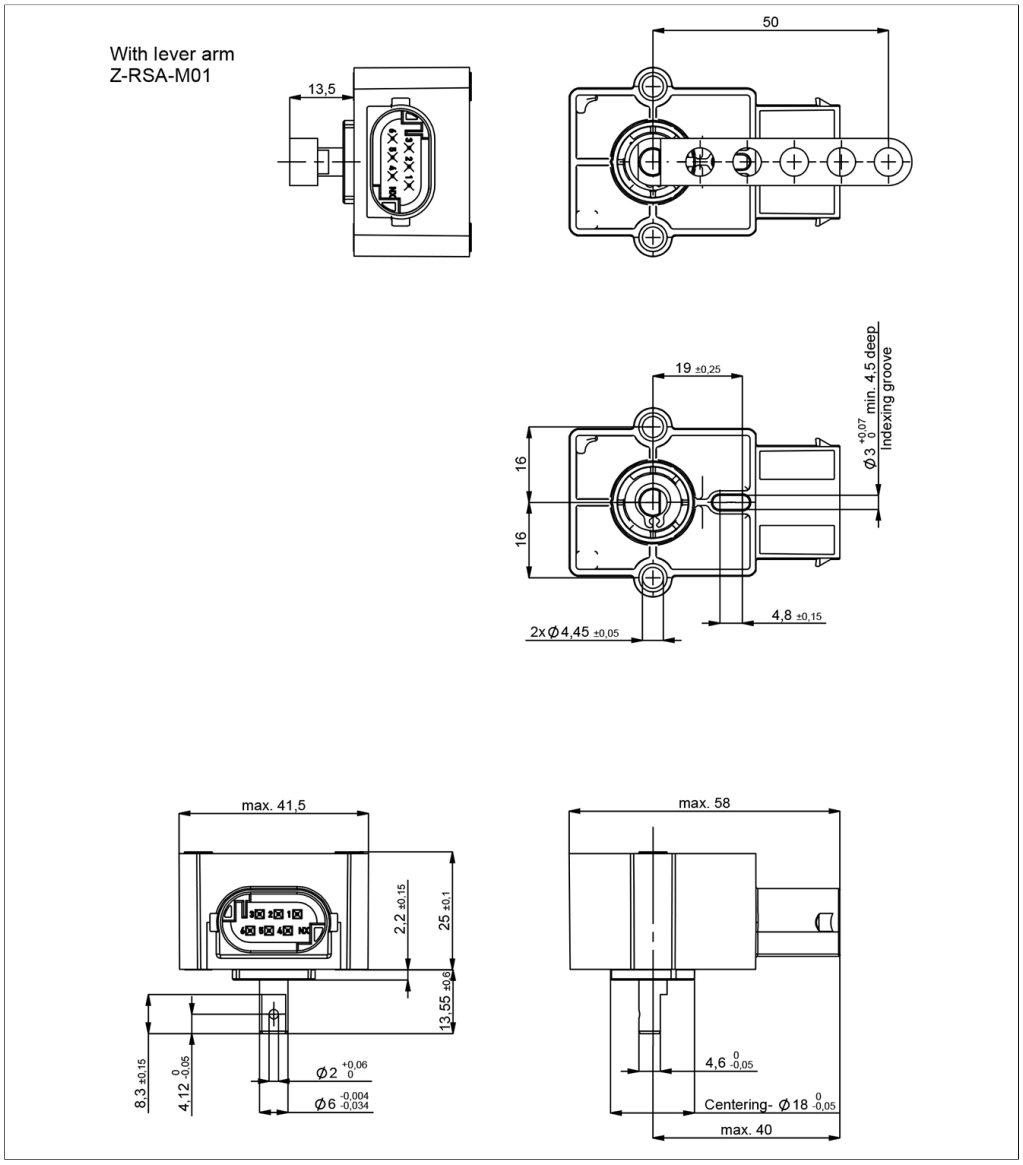
Number of channels
6: One-channel version (1x supply voltage Ub, 1x output)
7: Partly redundant version (1x supply voltage Ub, 2x output)
8: Fully redundant version (2x supply voltage Ub, 2x output)

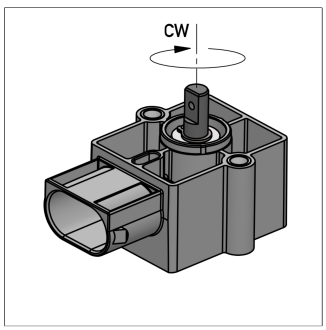
Mechanical version
Output characteristic A (standard)
3201: Standard design
3202: with mounted lever arm Z-RSA-M01

Output characteristic B (180° offset)
3221: Standard design
3222: with mounted lever arm Z-RSA-M01

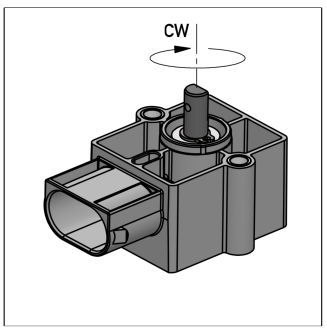
Series

Drawing





Output characteristic A
(standard)
RSA-3201/3202:
When the flattening of the shaft or the lever arm points towards the connector, the sensor is near the electrical center position.



Output characteristic B
(180° offset)
RSA-3221/3222:
When the flattening of the shaft or the lever arm is located opposite to the connector, the sensor is near the electrical center position.

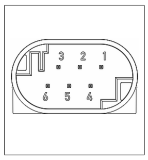
Technical Data

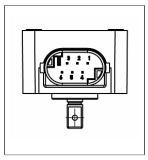
Type	**RSA-32_ _-_ _ _-32_-521**
Output signal	4 ... 20 mA
Burden	@Ub > 13 V: ≤ 500 Ω, @Ub ≤ 13 V: ≤ 250 Ω
Number of channels	1 / 2
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Update rate	typ. 3.4 kHz
Measuring range	0 ... 30° up to 0 ... 360° in 10°-steps
Absolute linearity at measuring range	360°: ≤ ±0.4 %FS, 240°: ≤ ±0.45 %FS, 180°: ≤ ±0.5 %FS, 120°: ≤ ±0.55 %FS, 60°: ≤ ±0.8 %FS, 30°: ≤ ±1.25 %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 < 180°: typ. ±1.2 %FS, Measuring range ≥ 180°: typ. ±0.6 %FS
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Current consumption w/o load	typ. 12 mA per channel
Overvoltage protection	60 VDC (10 min.)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (vs. GND and supply voltage Ub)
Insulation resistance (500 VDC)	≥ 10 MΩ
Environmental Data	
Max. operational speed	120 rpm (temporary 800 rpm)
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 ISO 20653	IP67 (shaft side), IP69K (housing incl. electronics)
Operating temperature	-40 ... +105°C* * The max. operating temperature depends on supply voltage Ub and burden (see temp.diagram)
Operating humidity	0 ... 98 % R.H. (no condensation)
Life	typ. 30 Mio. movements (when operated without lever)
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)	726 years (one-channel), 448 years (partly redundant, per channel) or 364 years (fully redundant, per channel)
MTTFd (EN ISO 13849-1 parts count method, w/o load)	1453 years (one-channel), 896 years (partly redundant, per channel) or 727 years (fully redundant, per channel)
MTTFd-certificate	
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
ISO 7637-2 Transient Emissions	Level 3
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b, 4, 5) Level 4
ISO 7637-3 Pulses on output lines	Level 4
EN 13309 Construction machinery	
Emission/Immunity E1	acc. to ECE-R10
ISO 13766-1/-2 Construction machinery	Any multi-channel version

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

Connection Assignment

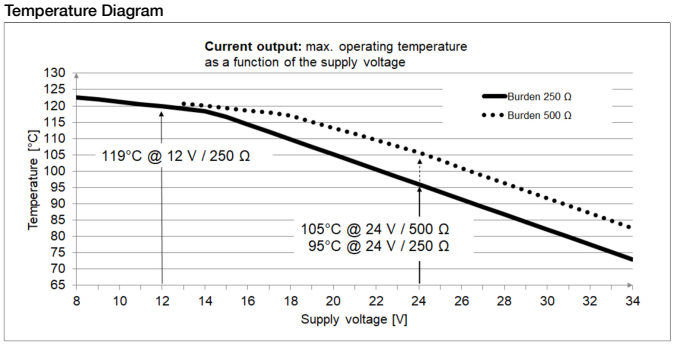
	One-channel	Partly redundant	Fully redundant
Supply voltage Ub 1	Pin 1	Pin 1	Pin 1
GND 1	Pin 2	Pin 2	Pin 2
Signal output 1	Pin 4	Pin 4	Pin 4
Signal output 2	-	Pin 3	Pin 3
Supply voltage Ub 2	-	-	Pin 6
GND 2	-	-	Pin 5
Not assigned	Pin 3, Pin 5, Pin 6	Pin 5, Pin 6	-



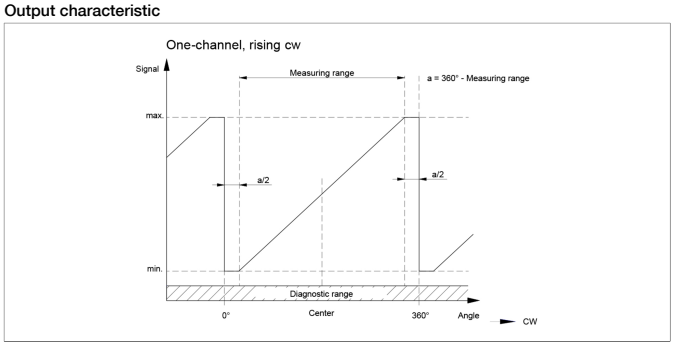


Technical Data
Output Characteristics

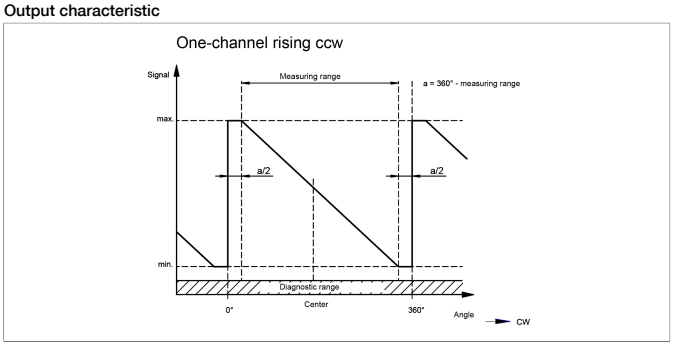
Temperature Diagram



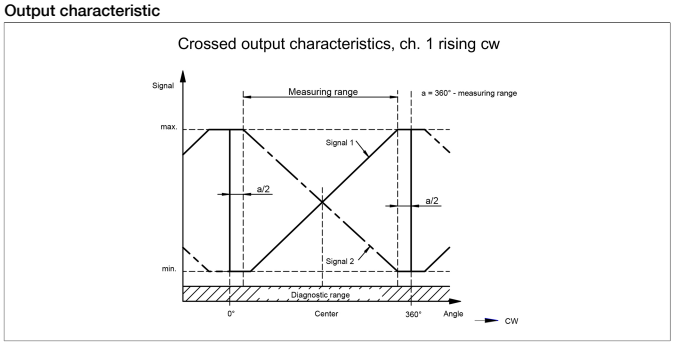
Output characteristic



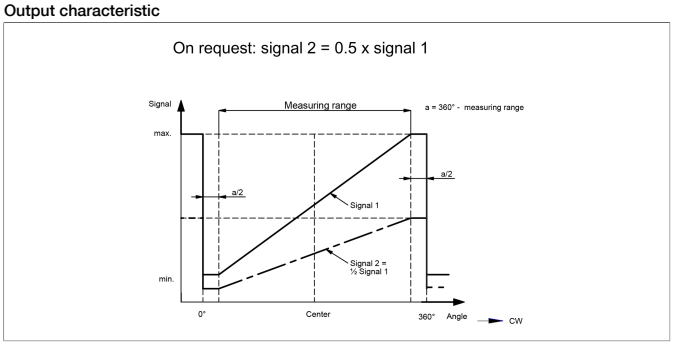
Output characteristic



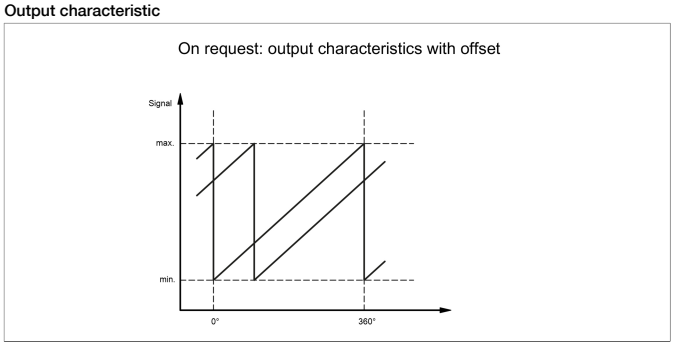
Output characteristic



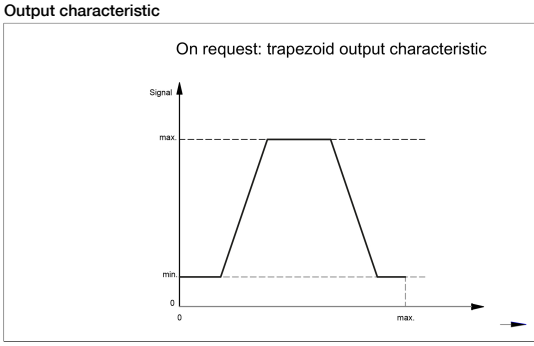
Output characteristic



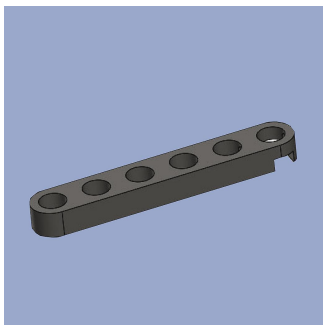
Output characteristic

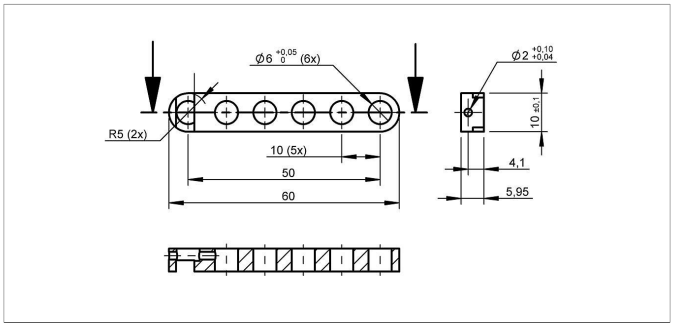


Output characteristic



Sensor Mounting



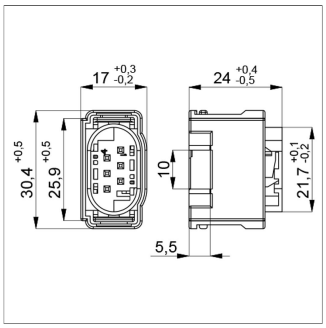


Z-RSA-M01
Lever arm 50 mm for mounting at shaft with locking pin (included in delivery).
Further levers (geometry, materials...) on request.

Material	Aluminium, anodized

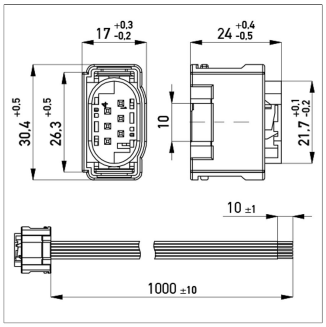
P/N	Type
400105062	Z-RSA-M01

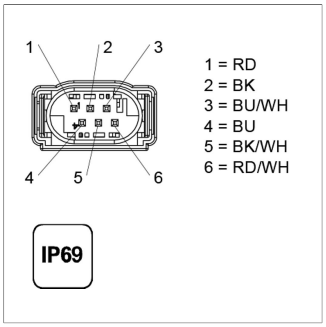
Connector System MQS



EEM-33-34
Connector kit MQS including
• 1 plug socket (female), PBT GF15, AMP P/N 1-967616-1
• 6 tinned contacts for cable cross-section area 0.25 ... 0.35 mm² (AWG 22), AMP-P/N 963727-1 or 5-962885-1
• 6 single conductor sealings AMP P/N 967067-2
Operating temp. -40 ... +120°C

P/N	Type
400005666	EEM-33-34





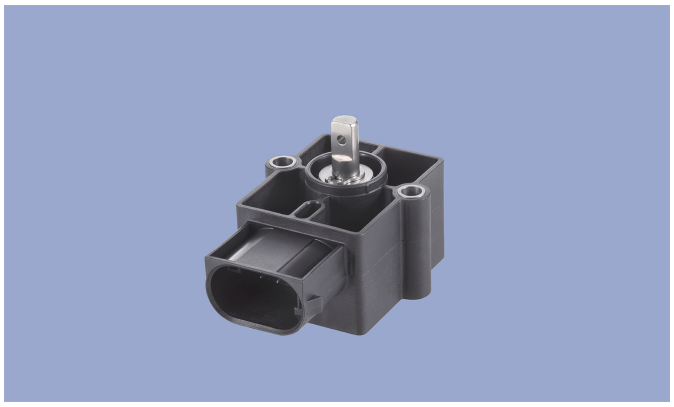
EEM-33-24
Connector MQS AMP P/N 1-967616-1, 6-pin, PBT GF15, with lead wires 0.5 mm², PVC, 1 m, open ended
Operating temp. -40 ... +120°C
Lead wires PVC, 6x0.5 mm²

P/N	Type	Length
400108029	EEM-33-24	1 m

novotechnik
Siedle Group

NOVOHALL
Rotary Sensor
Non-contacting

RSA-3200
Voltage
Mobile Applications



Special Features
- Contactless hall technology
- Electrical range up to 360°
- High protection class IP67 rep. IP69K (housing side)
- Resolution up to 12 bit
- Temperature range -40°C to +125°C
- One and multi-channel versions
- Optimized for use in mobile applications
- For highest EMC requirements such as ISO pulses and interference fields according to ISO 11452 and ECE directive
- Suitable for safety-related applications according to DIN EN ISO 13849
- Suitable for linkage lever mounting
- Other configurations see separate data sheets

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

Mobile working machines or truck conveyors place very high demands on the sensor system due to the external application.
The very compact angle sensor RSA-3200 offers reliable function under harsh operating conditions.
The sensor is optimized for mobile applications and is certified according to the highest EMC standards such as ISO pulses and interference fields according to ISO 11452.
Available are one and multi-channel versions which are suitable for use in safety-related applications. The stainless steel shaft is designed for assembling of lever arms.

Description	
Material	Housing: high grade, temperature resistant plastic PBT-GF with stainless steel inserts Shaft: stainless steel, X10CrNiS18-9 1.4305 / AISI 303 Sealing: HNBR 70
Mounting	With 2 screws M4
Fastening torque of mounting	250 ± 50 Ncm
Bearing	Sintered bronze bushing
Sealing	Double O-ring seal, electronics completely encapsulated
Electrical connection	6-pin MQS-connector, code A, tinned contact according to drawing AMP-114-18063-126, Index A1 (Connector: AMP P/N 1-967616-1)

Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Permitted shaft load (static)	40 N (axial) / 50 N (radial)
Torque	Typ. 1.5 Ncm Depending on the environmental temperature and standstill time, the necessary force for the inital operating of the shaft may increase
Weight	approx. 45 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
3: Ub = 12/24 VDC

Output signal
4: 0.5 ... 4.5 VDC
5: 0.25 ... 4.75 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
521: Connector AMP MQS 6-pin, male

R S A - 3 2 0 1 - 6 3 6 - 3 5 1 - 5 2 1

Measuring range
03: Angle 0° ... 30° min.
...
06, 12, 18, 24, 36
...
36: Angle 0° ... 360° max.
Other angles on request

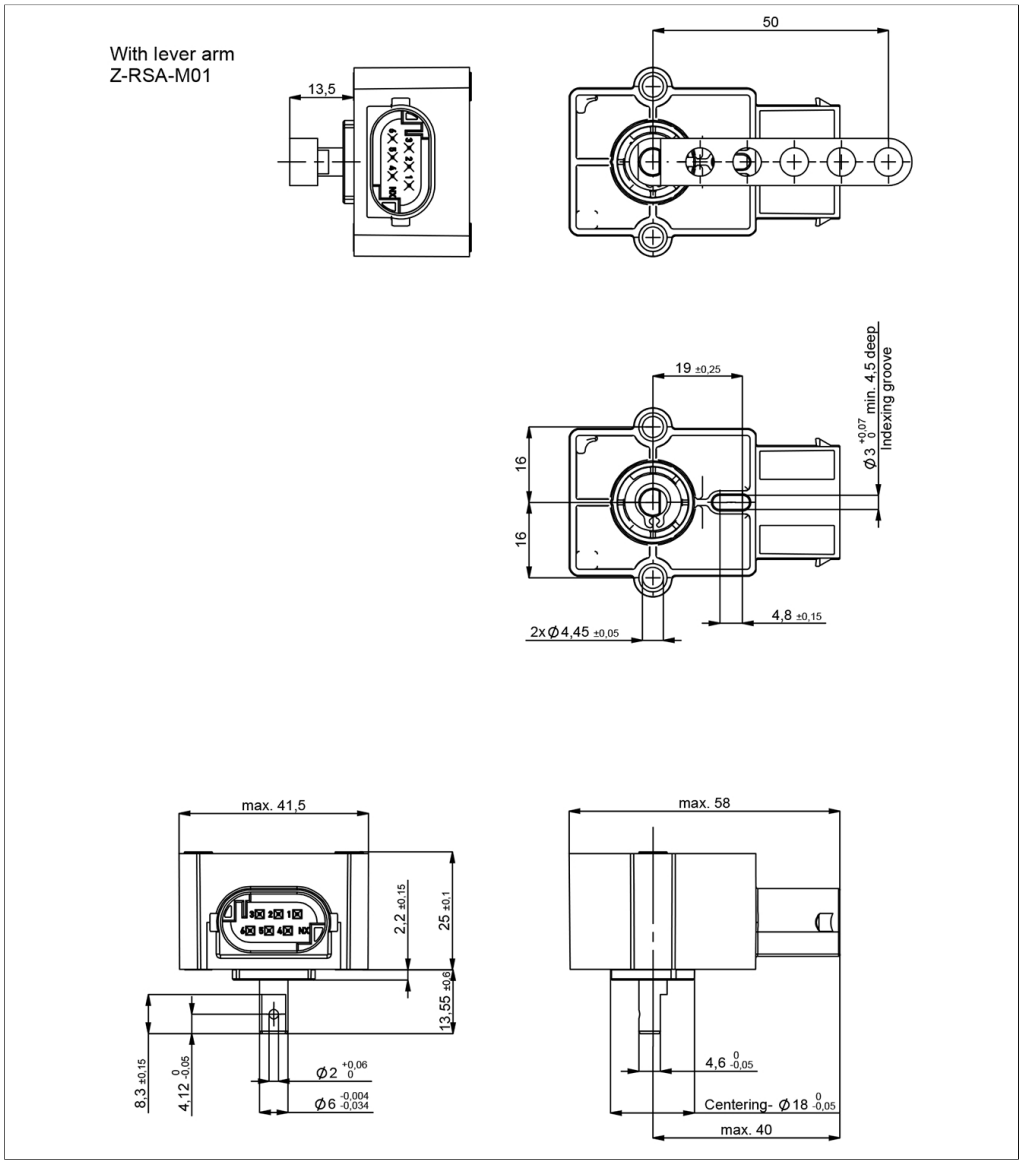
Number of channels
6: One-channel version (1x supply voltage Ub, 1x output)
7: Partly redundant version (1x supply voltage Ub, 2x output)
8: Fully redundant version (2x supply voltage Ub, 2x output)

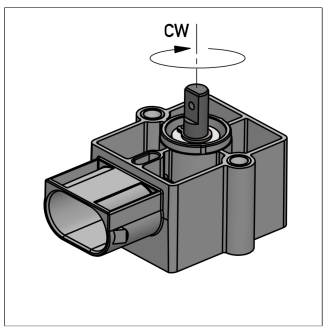
Series

Mechanical version
Output characteristic A (standard)
3201: Standard design
3202: with mounted lever arm Z-RSA-M01

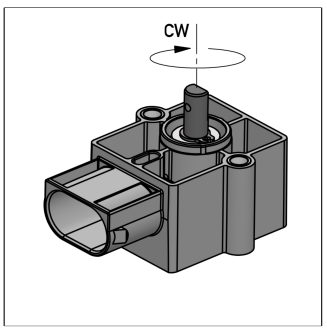
Output characteristic B (180° offset)
3221: Standard design
3222: with mounted lever arm Z-RSA-M01

Drawing





Output characteristic A
(standard)
RSA-3201/3202:
When the flattening of the shaft or the lever arm points towards the connector, the sensor is near the electrical center position.



Output characteristic B
(180° offset)
RSA-3221/3222:
When the flattening of the shaft or the lever arm is located opposite to the connector, the sensor is near the electrical center position.

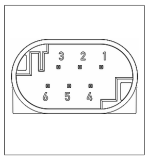
Technical Data

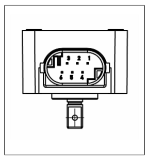
Type	**RSA-32_ _-_ _ _-3_ _-521**
Output signal	0.25 ... 4.75 V 0.5 ... 4.5 V
Load	≥ 10 kΩ
Number of channels	1 / 2
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Update rate	typ. 3.4 kHz
Measuring range	0 ... 30° up to 0 ... 360° in 10°-steps
Absolute linearity at measuring range	360°: ≤ ±0.4 %FS, 240°: ≤ ±0.45 %FS, 180°: ≤ ±0.5 %FS, 120°: ≤ ±0.55 %FS, 60°: ≤ ±0.8 %FS, 30°: ≤ ±1.25 %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 < 180°: typ. ±1.0 %FS, Measuring range ≥ 180°: typ. ±0.5 %FS
Supply voltage Ub	12/24 VDC (8 ... 34 VDC)
Current consumption w/o load	typ. 12 mA per channel
Overvoltage protection	60 VDC (10 min.)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (vs. GND and supply voltage Ub)
Insulation resistance (500 VDC)	≥ 10 MΩ
Environmental Data	
Max. operational speed	120 rpm (temporary 800 rpm)
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 ISO 20653	IP67 (shaft side), IP69K (housing incl. electronics)
Operating temperature	-40 ... +125°C* * The max. operating temperature depends on supply voltage Ub (see temp.diagram)
Operating humidity	0 ... 98 % R.H. (no condensation)
Life	typ. 30 Mio. movements (when operated without lever)
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)	766 years (one-channel), 488 years (partly redundant, per channel) or 383 years (fully redundant, per channel)
MTTFd (EN ISO 13849-1 parts count method, w/o load)	1533 years (one-channel), 977 years (partly redundant, per channel) or 767 years (fully redundant, per channel)
MTTFd-certificate	
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
ISO 7637-2 Transient Emissions	Level 3
ISO 7637-2 Pulses on supply lines	(1, 2a, 2b, 3a, 3b, 4, 5) Level 4
ISO 7637-3 Pulses on output lines	Level 4
EN 13309 Construction machinery	
Emission/Immunity E1	acc. to ECE-R10
ISO 13766-1/-2 Construction machinery	Any multi-channel version

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

Connection Assignment

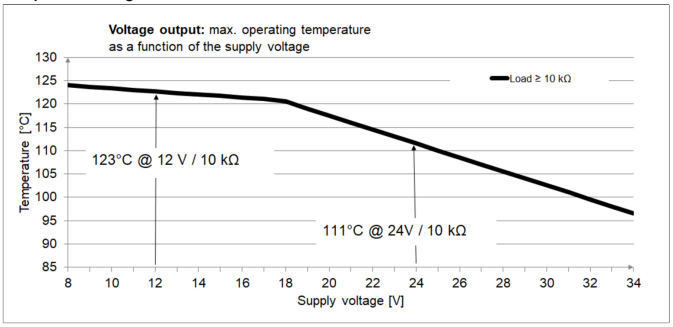
	One-channel	Partly redundant	Fully redundant
Supply voltage Ub 1	Pin 1	Pin 1	Pin 1
GND 1	Pin 2	Pin 2	Pin 2
Signal output 1	Pin 4	Pin 4	Pin 4
Signal output 2	-	Pin 3	Pin 3
Supply voltage Ub 2	-	-	Pin 6
GND 2	-	-	Pin 5
Not assigned	Pin 3, Pin 5, Pin 6	Pin 5, Pin 6	-



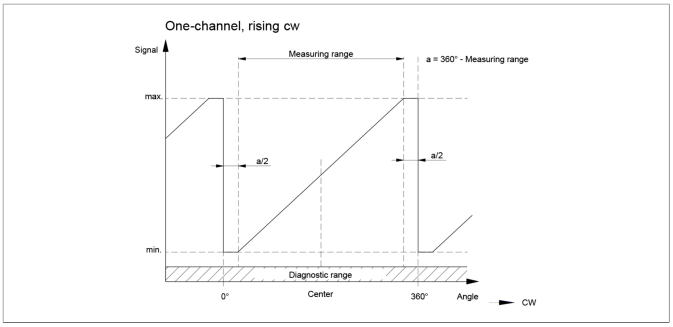


Technical Data
Output Characteristics

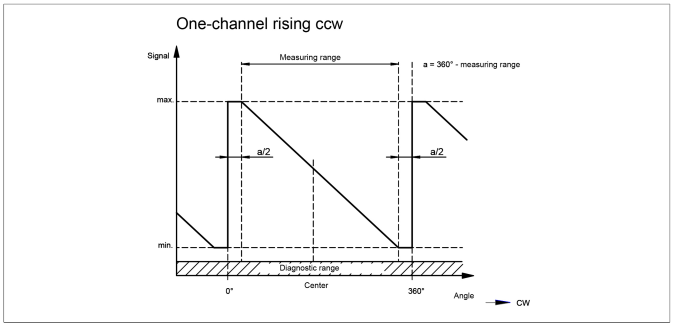
Temperature Diagram



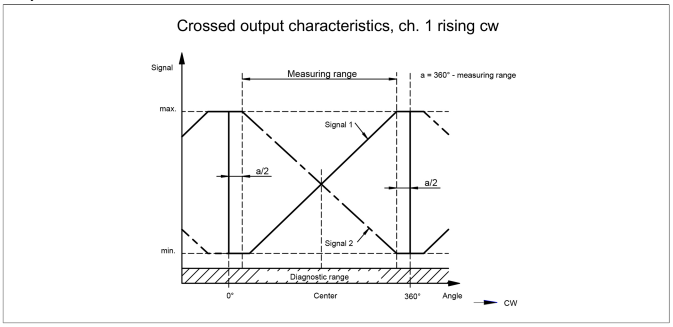
Output characteristic



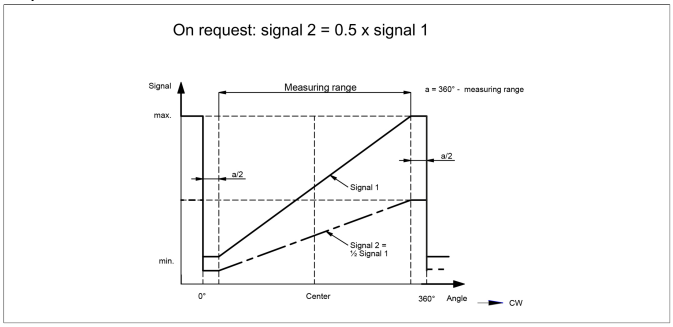
Output characteristic



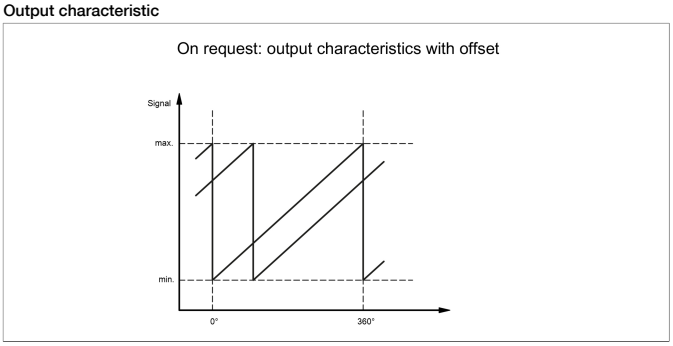
Output characteristic



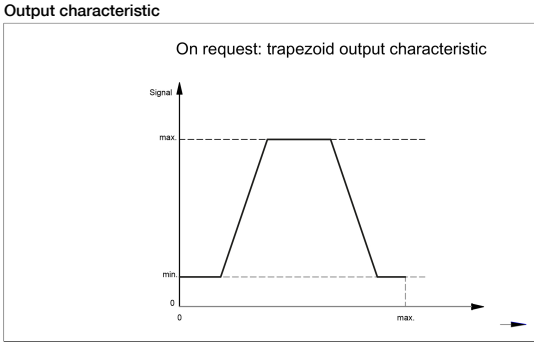
Output characteristic



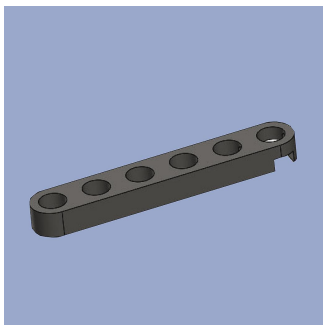
Output characteristic

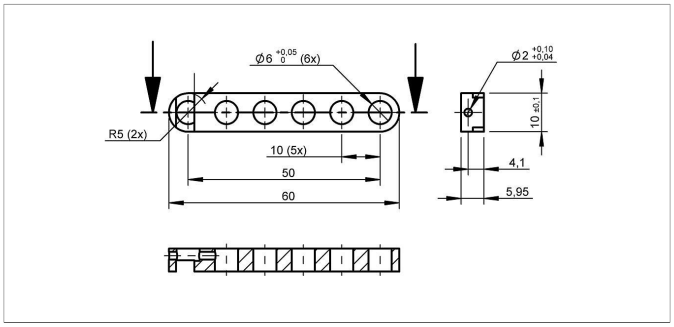


Output characteristic



Sensor Mounting



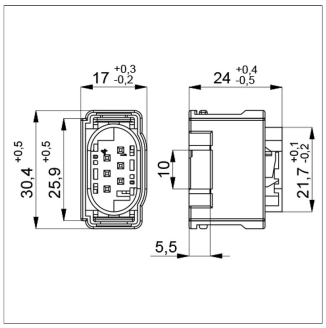


Z-RSA-M01
Lever arm 50 mm for mounting at shaft with locking pin (included in delivery).
Further levers (geometry, materials...) on request.

Material	Aluminium, anodized

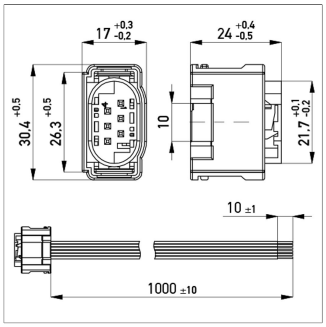
P/N	Type
400105062	Z-RSA-M01

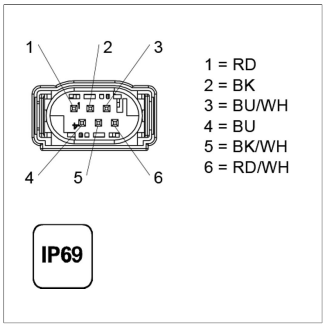
Connector System MQS



EEM-33-34
Connector kit MQS including
• 1 plug socket (female), PBT GF15, AMP P/N 1-967616-1
• 6 tinned contacts for cable cross-section area 0.25 ... 0.35 mm² (AWG 22), AMP-P/N 963727-1 or 5-962885-1
• 6 single conductor sealings AMP P/N 967067-2
Operating temp. -40 ... +120°C

P/N	Type
400005666	EEM-33-34





EEM-33-24
Connector MQS AMP P/N 1-967616-1, 6-pin, PBT GF15, with lead wires 0.5 mm², PVC, 1 m, open ended
Operating temp. -40 ... +120°C
Lead wires PVC, 6x0.5 mm²

P/N	Type	Length
400108029	EEM-33-24	1 m

novotechnik
Siedle Group

Preliminary Data sheet

NOVOTURN
Multi-turn Sensor
Non-contacting

MC1-2800
CANopen
Mobile Applications

Special Features
- Non-contacting, magnetic
- Long life
- Measuring range 15840° (44 turns)
- True-Power-On system: counts turns even when not powered. Patented non-volatile technology does not require gears or batteries
- Available with push-on coupling or marked shaft
- Easy mounting
- Protection class IP54 up to IP67
- Resolution 16 bits per revolution
- Other configurations see separate data sheets

Applications
- Mechanical engineering
- Mobile machinery
- Driveline or steering systems
- Wire-actuated encoders
- Gate drives
- Motor sports

Multi-turn sensors that use the GMR technology (giant magneto resistance), provide absolute position values, do not require any reference signals and need no power supply or buffer battery for detecting the revolutions. The fact that rotations are detected even unpowered and the sensor does not lose its position information during a power failure, makes the MC1-2800 with its diameter of only 30 mm an extremely compact real True-Power-On rotary sensor.
The sensor operates magnetically and thus contactless allowing an extremely long life.
The sensor is able to detect angular positions over up to 44 revolutions with a high resolution up to 16 bits per revolution.

Description	
Material	Housing: high grade, temperature resistant plastic PPS-GF Shaft: stainless steel, X8CrNiS18-9 1.4305
Mounting	With 2 screws M4 and washers
Fastening torque of mounting	140 ± 40 Ncm
Bearing	Sintered bronze bushing
Electrical connection	Cable 2x 2x 0.34 mm² (AWG 22), TPE, shielded / Connector M12x1, A-coded with cable L = 0.15 m

Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Permitted shaft load static or dynamic	20 N (axial / radial)
Torque	Typ. ≤ 3 Ncm Depending on the environmental temperature and standstill time, the necessary force for the inital operating of the shaft may increase
Weight	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

Interface
6: CANopen

Interface parameters
1: 1x position, 1x speed

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

Electrical connection
232: Cable, 4-pole, shielded, L = 1 m
236: Cable, 4-pole, shielded, L = 3 m
240: Cable, 4-pole, shielded, L = 5 m
511: Connector M12x1, 5-pin, with cable, shielded, L = 0.15 m
Cable versions and assembled connectors on request

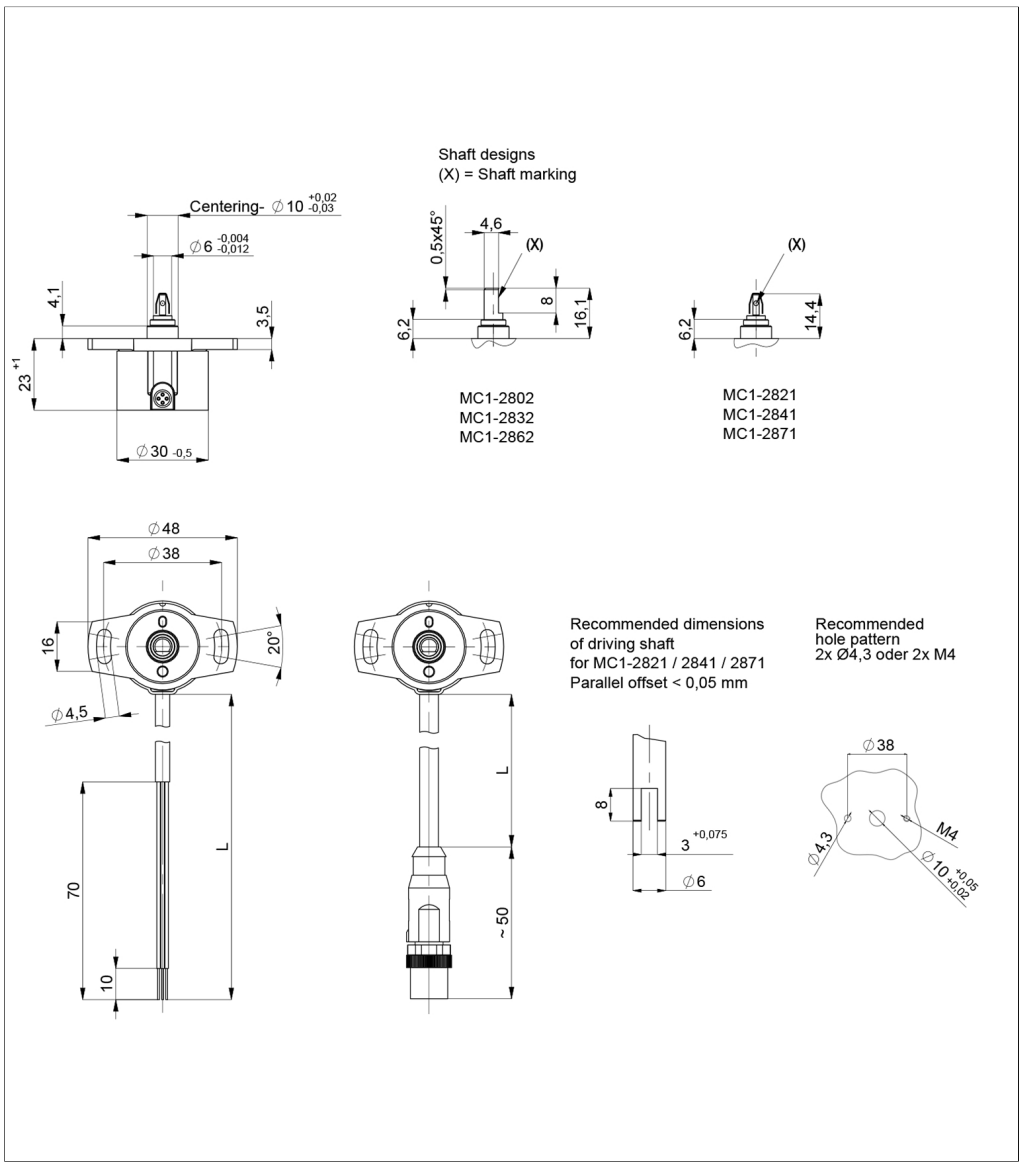
M	C	1	–	2	8	3	2	–	A	7	F	–	6	1	4	–	2	3	2

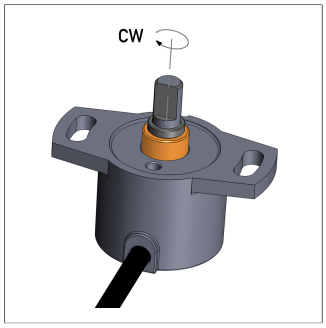
Parameterization
A7F: Start in Pre-Operational Mode, Event-Timer 0 ms, Node ID 127
Other parameterizations (e.g. Node ID) on request

Mechanical version
2802: 6 mm shaft with flattening, IP54
2832: 6 mm shaft with flattening, IP65
2862: 6 mm shaft with flattening, IP67
2821: push-on coupling, IP54
2841: push-on coupling, IP65
2871: push-on coupling, IP67
Other shaft configurations on request

Series

Drawing





When the marking of the shaft is pointing towards the electrical outlet, the sensor output is located on an integer turn position.

Technical Data

CANopen

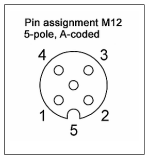
Type	**MC1-28_ _-2_ _-6_ _-_ _ _** **CANopen**
Measured variables	Position, speed and temperature
Measuring range	44 turns = 15840°
Measuring range speed	0 ... 546 rpm
Number of channels	1
Protocol	CANopen protocol to CiA DS-301 V4.2.0, Device profile DS-406 V3.2.0 Encoder Class C2, LSS services to CiA DS-305 V3.0.0
Programmable parameters	Position, speed, temperature, cams, working areas, preset, rotation direction, node ID, baud rate, averaging, resolution position, resolution speed
Condition monitoring functions	Statistical data on temperature, operating time, supply voltage, running performance
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Node ID	1 ... 127 (default 127)
Transfer rate	50 ... 1000 kBaud
Update rate (internal)	1 kHz
Signal propagation delay	< 0.3 ms
Resolution position (across 360°)	16 bits
Resolution speed	0.1°/s
Absolute linearity *	≤ ±1°
Repeatability *	≤ ±0.1°
Hysteresis *	≤ ±0,5°
Temperature error	±0.36°
Supply voltage Ub	12/24 VDC (8 ... 32 VDC)
Current consumption w/o load	≤ 70 mA
Overvoltage protection	45 VDC (permanent)
Polarity protection	yes (supply lines and outputs)
Short circuit protection	yes (all outputs vs. GND and supply voltage)
Insulation resistance (500 VDC)	≥ 10 MΩ
Bus termination internal	w/o (internal load resistance 120 Ω on request)
	*) For the MC1-2821/2841/2871 models with push-on coupling, the values can change mechanically caused (up to a factor of 2) if the recommended dimensions of driving shaft is not adhered to or if installed excentric or after numerous plug-in cycles.
Environmental Data	
Max. operational speed	800 rpm
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	IP54 / IP65 / IP67
Operating temperature	-40 ... +85°C -25 ... +85°C (connector M12)
Insensitivity to magnetic DC fields	< 15 mT
Life	> 50 Mio. movements (mechanically)
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	tbd
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
Conformity/Approval	

EMC Compatibility	
ISO 13766-1 Construction machinery	
ISO 14982 Agricult./forestry machines	
Emission/Immunity E1	E1 compliant
EN 61000-4-2 ESD (contact/air discharge)	4 kV, 8 kV
EN 61000-4-3 Electromagnetic fields (RFI)	30 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

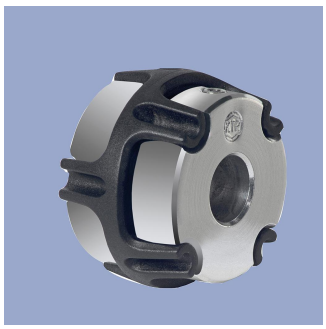
Important:
While operation, care should be taken not to rotate the sensor shaft below 0° or above 5760°. Refer to users manual.

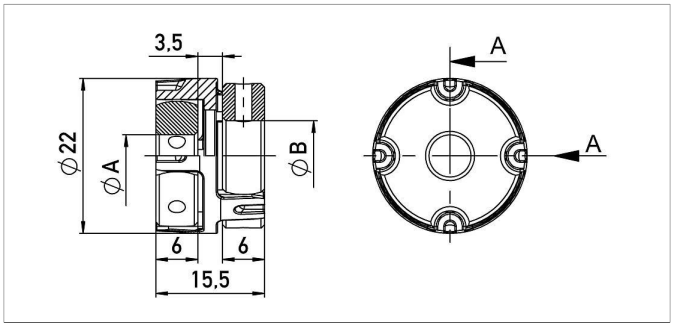
Connection Assignment

Signal	Cable code 2_ _	Connector code 5_ _
Supply voltage Ub	WH	Pin 2
GND	BN	Pin 3
CAN_H	YE	Pin 4
CAN_L	GN	Pin 5
CAN_SHLD	Shield	Pin 1
	Connect cable shielding to GND	



Sensor Mounting



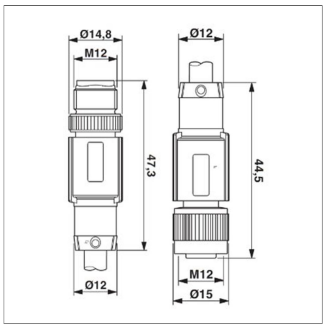


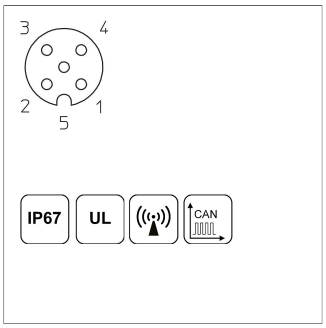
Z-106-G-_
Backlash-free, double cardanic shaft coupling for Ø6 mm to Ø6 mm, Ø6.35 mm or Ø10 mm, mounting via 2 threaded pins with internal hexagon

Material	Aluminium, PEEK
Operating temp.	-40 ... +160°C
Transferable torque	≤ 1 Nm
Displacement	rad. ≤ 0.1 mm, angl. ≤ 0.45°

P/N	Type	ØA / ØB [mm]
400103910	Z-106-G-6	6 / 6
400103912	Z-106-G-6,35	6 / 6.35
400103913	Z-106-G-10	6 / 10

Connector System M12

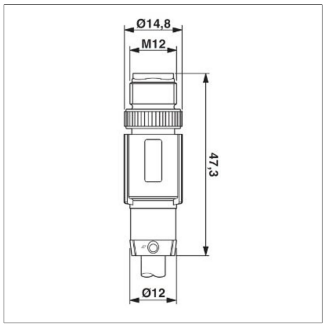


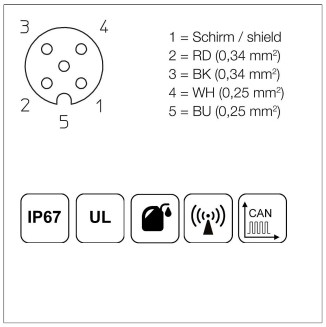


EEM-33-52
M12x1 Mating female/male connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), CAN-Bus

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

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

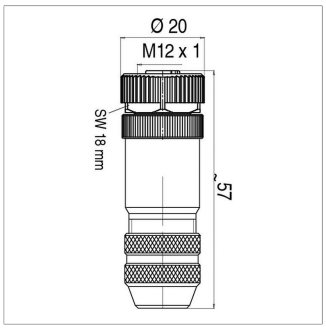


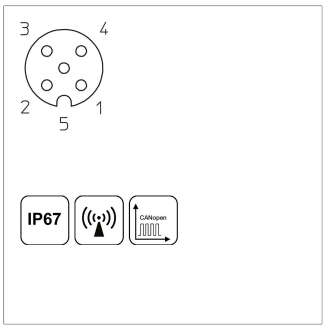


EEM-33-49/50/51
M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), open ended

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

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

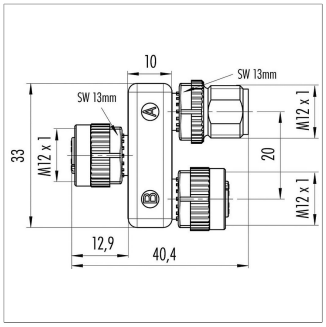


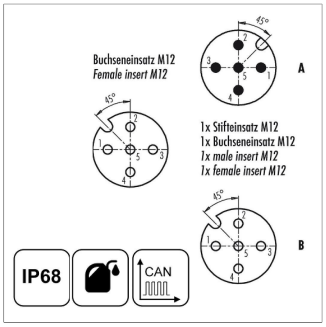


EEM-33-73
M12x1 Mating female connector, 5-pin, straight, A-coded, with coupling nut, screw termination, IP67, shieldable, CAN bus

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

P/N	Type
400005645	EEM-33-73



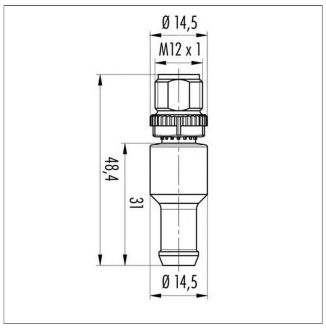


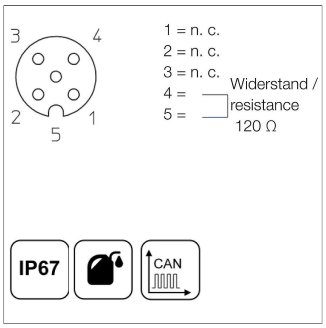
EEM-33-45
M12x1 splitter / T-connector, 5-pin, A-coded, IP68,1:1 connection, female - male - female, CAN-Bus

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056145	EEM-33-45

Connector System M12





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

Plug housing	PUR, -25 ... +85°C

P/N	Type
400056147	EEM-33-47

IP67 Protection class IP67 DIN EN 60529

IP68 Protection class IP68 DIN EN 60529

Very good Electromagnetic Compatibiliy (EMC) and shield systems

Very good resistance to oils, coolants and lubricants

Suited for applications in dragchains

UL UL - approved

CAN CAN-Bus

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
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Preliminary Data sheet

NOVOTURN
Multi-turn Sensor
Non-contacting

MC1-2800
Ratiometric
Industrial

Special Features
- Non-contacting, magnetic
- Long life
- Measuring range 15840° (44 turns)
- True-Power-On system: counts turns even when not powered. Patented non-volatile technology does not require gears or batteries
- Available with push-on coupling or marked shaft
- Easy mounting
- Protection class IP54 up to IP67
- Resolution 16 bits per revolution
- Other configurations see separate data sheets

Applications
- Mechanical engineering
- Mobile machinery
- Driveline or steering systems
- Wire-actuated encoders
- Gate drives
- Motor sports

Multi-turn sensors that use the GMR technology (giant magneto resistance), provide absolute position values, do not require any reference signals and need no power supply or buffer battery for detecting the revolutions. The fact that rotations are detected even unpowered and the sensor does not lose its position information during a power failure, makes the MC1-2800 with its diameter of only 30 mm an extremely compact real True-Power-On rotary sensor.
The sensor operates magnetically and thus contactless allowing an extremely long life.
The sensor is able to detect angular positions over up to 44 revolutions with a high resolution up to 16 bits per revolution.

Description	
Material	Housing: high grade, temperature resistant plastic PPS-GF Shaft: stainless steel, X8CrNiS18-9 1.4305
Mounting	With 2 screws M4 and washers
Fastening torque of mounting	140 ± 40 Ncm
Bearing	Sintered bronze bushing
Electrical connection	Cable 4x 0.5 mm² (AWG 20), TPE, shielded / Connector M12x1, A-coded with cable L = 0.15 m

Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Permitted shaft load static or dynamic	20 N (axial / radial)
Torque	Typ. ≤ 3 Ncm Depending on the environmental temperature and standstill time, the necessary force for the inital operating of the shaft may increase
Weight	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

Interface parameters
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 output characteristic cw
2: Rising output characteristic ccw
Other output characteristics on request

Electrical connection
202: Cable, 4-pole, shielded, L = 1 m
206: Cable, 4-pole, shielded, L = 3 m
210: Cable, 4-pole, shielded, L = 5 m
501: Connector M12x1, 4-pin, with cable, shielded, L = 0.15 m
Cable versions and assembled connectors on request

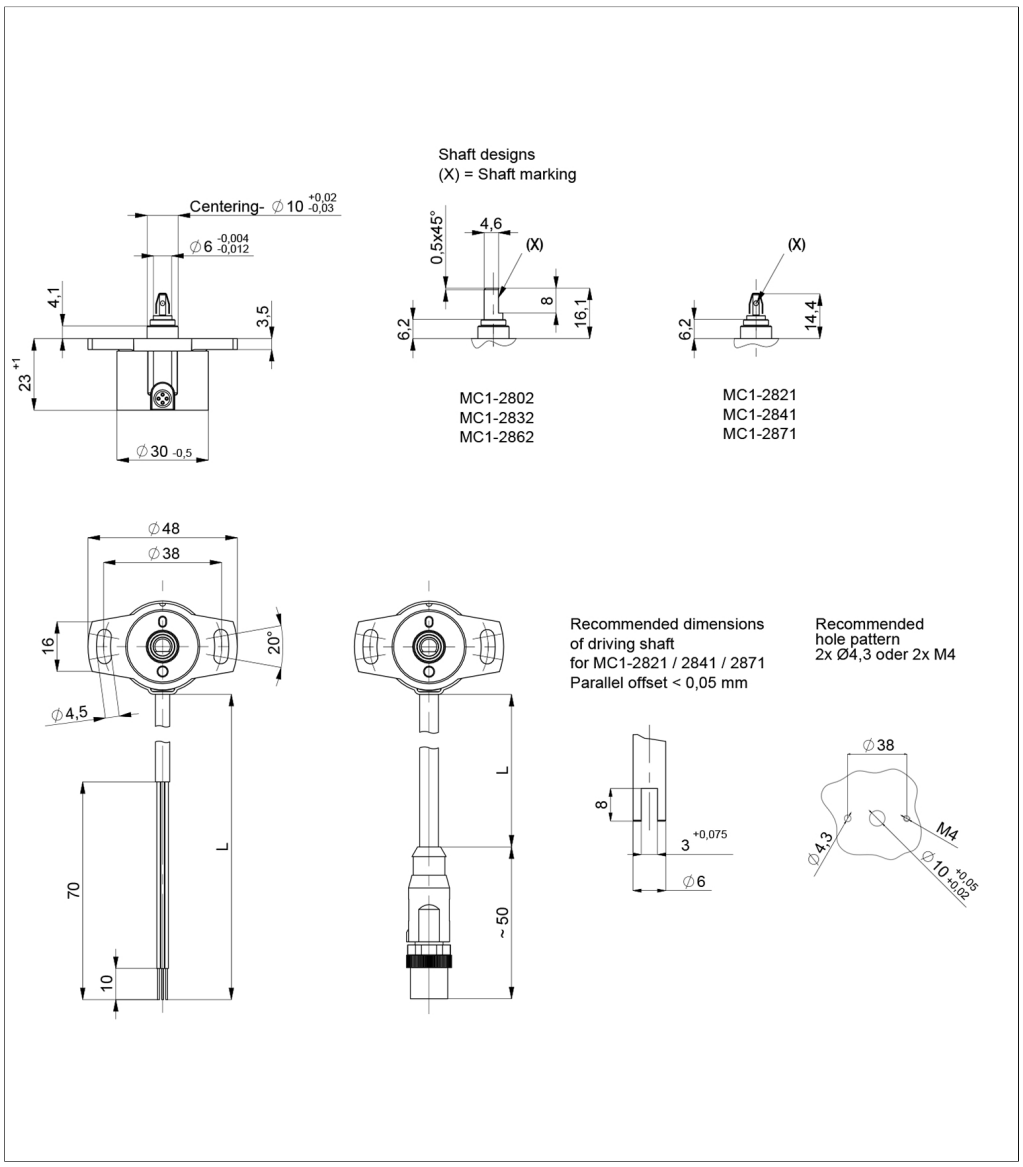
M	C	1	–	2	8	3	2	–	0	1	0	–	2	1	1	–	2	0	2

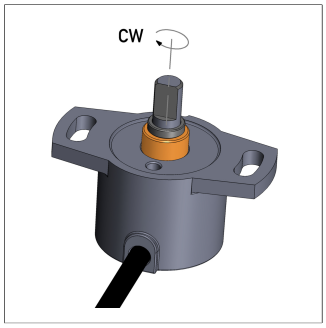
Series

Mechanical version
2802: 6 mm shaft with flattening, IP54
2832: 6 mm shaft with flattening, IP65
2862: 6 mm shaft with flattening, IP67
2821: push-on coupling, IP54
2841: push-on coupling, IP65
2871: push-on coupling, IP67
Other shaft configurations on request

Number of turns for output characteristic
001 ... 044: 1 up to 44 turns
Increment 1 turn, X turns correspond to a measuring angle of X • 360°
001, 003, 006, 010, 016, 025, 044: 1, 3, 6, 10, 16, 25, 44 turns
Other measuring angles on request

Drawing





When the marking of the shaft is pointing towards the electrical outlet, the sensor output is located on an integer turn position.

Technical Data

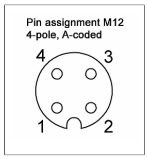
Type	**MC1-_ _ _ _-_ _ _-2_ _-_ _ _** **Ratiometric**
Output signal	ratiometric to supply voltage Ub 5 ... 95% (0.25 ... 4.75 V) 10 ... 90% (0.5 ... 4.5 V)
Load	≥ 10 kΩ
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Update rate	tbd
Measuring range	0 ... 360° up to 0 ... 15840° in 360°-steps (1 to 44 turns)
Independent linearity *	1 turn: tbd 3 turns: typ. ≤ ±0.167 %FS, max. ≤ ±0.267 %FS 6 turns: typ. ≤ ±0.083 %FS, max. ≤ ±0.183 %FS 10 turns: typ. ≤ ±0.05 %FS, max. ≤ ±0.15 %FS 16 turns: typ. ≤ ±0.031 %FS, max. ≤ ±0.131 %FS 44 turns: tbd
Resolution	16 bits over the entire measuring range
Repeatability *	≤ ±0.1°
Hysteresis *	≤ ±0,5°
Temperature error	±0.15 %FS
Supply voltage Ub	5 VDC (4.5 ... 5.5 VDC)
Current consumption w/o load	≤ 50 mA
Overvoltage protection	24 VDC (60 min.)
Polarity protection	yes (supply lines)
Short circuit protection	yes (output vs. GND and supply voltage)
Insulation resistance (500 VDC)	≥ 10 MΩ
	*) For the MC1-2821/2841/2871 models with push-on coupling, the values can change mechanically caused (up to a factor of 2) if the recommended dimensions of driving shaft is not adhered to or if installed excentric or after numerous plug-in cycles.
Environmental Data	
Max. operational speed	800 rpm
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	IP54 / IP65 / IP67
Operating temperature	-40 ... +85°C -25 ... +85°C (connector M12)
Insensitivity to magnetic DC fields	< 15 mT
Life	> 50 Mio. movements (mechanically)
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	> 20 years
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
Conformity/Approval	

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

Important:
While operation, care should be taken not to rotate the sensor shaft below 0° or above 15840°. Refer to users manual.
FS = Full scale: Signal span according to electrical measuring range

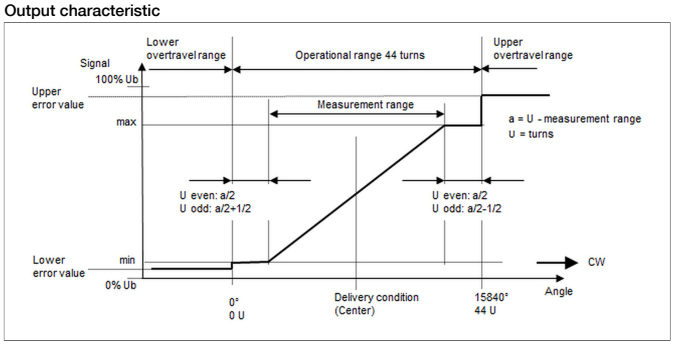
Connection Assignment

Signal	Cable code 2_ _	Connector code 5_ _
Supply voltage Ub	GN	Pin 1
GND	BN	Pin 3
Signal output	WH	Pin 2
Do not connect	YE	Pin 4
	Connect cable shielding to protection earth	

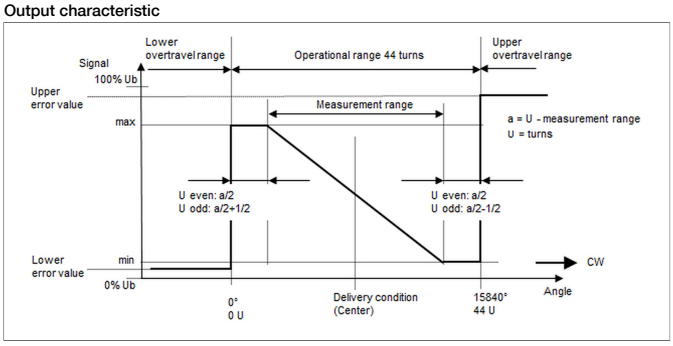


Technical Data
Output Characteristics

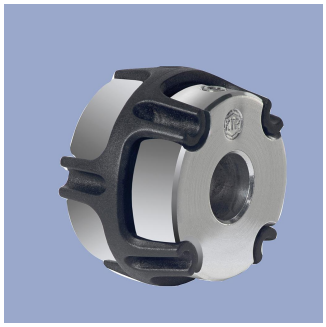
Output characteristic

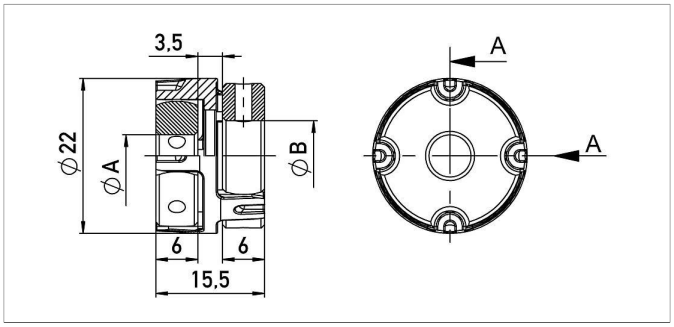


Output characteristic



Sensor Mounting



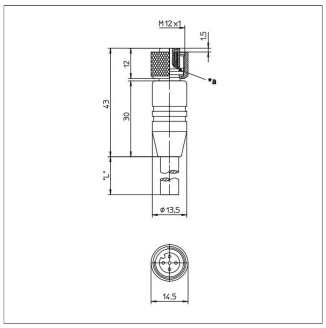


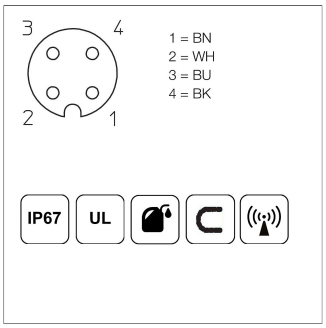
Z-106-G-_
Backlash-free, double cardanic shaft coupling for Ø6 mm to Ø6 mm, Ø6.35 mm or Ø10 mm, mounting via 2 threaded pins with internal hexagon

Material	Aluminium, PEEK
Operating temp.	-40 ... +160°C
Transferable torque	≤ 1 Nm
Displacement	rad. ≤ 0.1 mm, angl. ≤ 0.45°

P/N	Type	ØA / ØB [mm]
400103910	Z-106-G-6	6 / 6
400103912	Z-106-G-6,35	6 / 6.35
400103913	Z-106-G-10	6 / 10

Connector System M12





EEM-33-32/62/97

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

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

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

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

Preliminary Data sheet

NOVOTURN
Multi-turn Sensor
Non-contacting

MC1-2800
IO-Link
Industrial

Special Features
- Non-contacting, magnetic
- Long life
- Measuring range 15840° (44 turns)
- True-Power-On system: counts turns even when not powered. Patented non-volatile technology does not require gears or batteries
- Available with push-on coupling or marked shaft
- Easy mounting
- Protection class IP54 up to IP67
- Resolution 16 bits per revolution
- Other configurations see separate data sheets

Applications
- Mechanical engineering
- Mobile machinery
- Driveline or steering systems
- Wire-actuated encoders
- Gate drives
- Motor sports

Multi-turn sensors that use the GMR technology (giant magneto resistance), provide absolute position values, do not require any reference signals and need no power supply or buffer battery for detecting the revolutions. The fact that rotations are detected even unpowered and the sensor does not lose its position information during a power failure, makes the MC1-2800 with its diameter of only 30 mm an extremely compact real True-Power-On rotary sensor.
The sensor operates magnetically and thus contactless allowing an extremely long life.
The sensor is able to detect angular positions over up to 44 revolutions with a high resolution up to 16 bits per revolution.

Description	
Material	Housing: high grade, temperature resistant plastic PPS-GF Shaft: stainless steel, X8CrNiS18-9 1.4305
Mounting	With 2 screws M4 and washers
Fastening torque of mounting	140 ± 40 Ncm
Bearing	Sintered bronze bushing
Electrical connection	Cable 4x 0.5 mm² (AWG 20), TPE, unshielded / Connector M12x1, 4-pin, A-coded

Mechanical Data	
Dimensions	See dimension drawing
Mechanical travel	continuous
Permitted shaft load static or dynamic	20 N (axial / radial)
Torque	Typ. ≤ 3 Ncm Depending on the environmental temperature and standstill time, the necessary force for the inital operating of the shaft may increase
Weight	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

Interface
A: IO-Link

Interface parameters
10: 1x position (SSP 4.2.1 Ed.2) , rising cw
11: 1x position, rising cw
12: 1x position, 1x speed, rising cw
Other process data on request

Electrical connection
252: Cable, 4-pole, unshielded, L = 1 m
256: Cable, 4-pole, unshielded, L = 3 m
260: Cable, 4-pole, unshielded, L = 5 m
551: Connector M12x1, 4-pin, unshielded, with cable, L= 0.15 m
Cable versions and assembled connectors on request

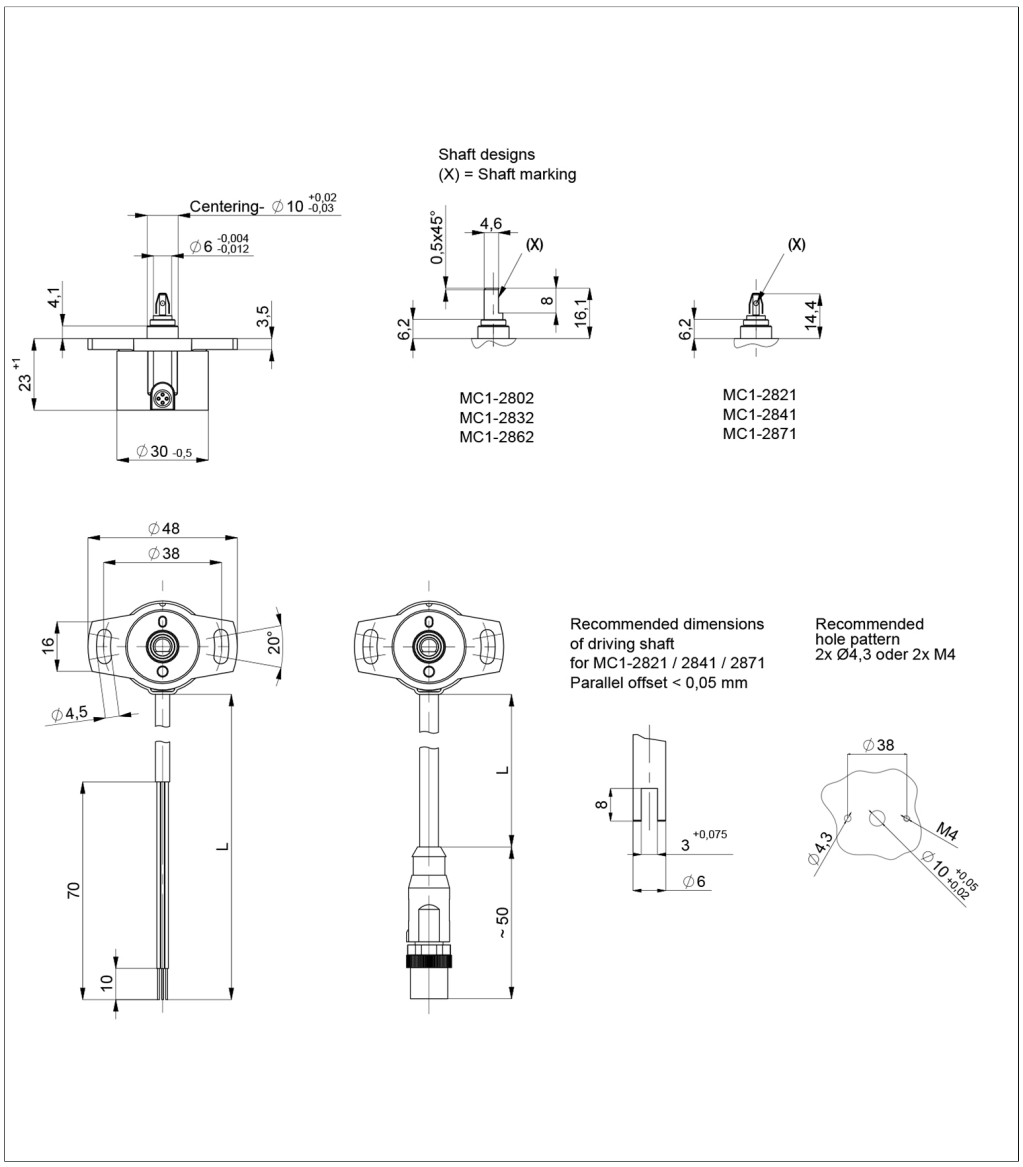
M C 1 – 2 8 3 2 – 2 4 4 – A 1 1 – 2 5 2

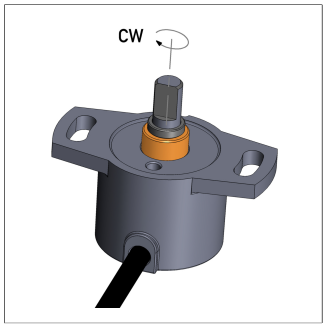
Series

Mechanical version
2802: 6 mm shaft with flattening, IP54
2832: 6 mm shaft with flattening, IP65
2862: 6 mm shaft with flattening, IP67
2821: push-on coupling, IP54
2841: push-on coupling, IP65
2871: push-on coupling, IP67
Other shaft configurations on request

Number of turns for output characteristic
244: 44 turns = 15840°

Drawing





When the marking of the shaft is pointing towards the electrical outlet, the sensor output is located on an integer turn position.

Technical Data

IO-Link

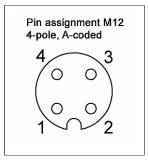
Type	**MC1-28_ _-2_ _-A_ _-_ _ _** **IO-Link**
Measured variables	Position (includ. revolution counter), speed, switches
Measuring range	44 turns = 15840°
Measuring range speed	0 ... 546 rpm
Number of channels	1
Protocol	IO-Link Spec V1.1 to IEC 61131-9, Smart Sensor Profile Ed. 2 Digital Measuring Sensor SSP 4.2.1 (V1.0 compatible)
Programmable parameters	Null point offset, averaging, rotating direction, switches, work area, operating modes
Condition monitoring functions	Statistical data on temperature, operating time, supply voltage, running performance
Diagnosis	activated (in case of error, output signal is outside of the plausible signal range)
Resolution position (across 360°)	16 bits
Resolution speed	0.1°/s
Update rate	1 kHz
Signal propagation delay	< 0.2 ms
Transfer rate	COM 3 (230.4 kBaud)
Frame type	2.2
Minimum cycle time	1 ms
Absolute linearity *	≤ ±1°
Repeatability *	≤ ±0.1°
Hysteresis *	≤ ±0,5°
Temperature error	±0.1 %FS
Supply voltage Ub	24 VDC (16 ... 30 VDC)
Current consumption w/o load	≤ 30 mA @24 V
Power drain w/o load	< 0.72 W
Polarity protection	yes (supply lines)
Short circuit protection	yes (output vs. GND and supply voltage up to 40 VDC)
Overvoltage protection	36 VDC (permanent)
Insulation resistance (500 VDC)	≥ 10 MΩ
	*) For the MC1-2821/2841/2871 models with push-on coupling, the values can change mechanically caused (up to a factor of 2) if the recommended dimensions of driving shaft is not adhered to or if installed excentric or after numerous plug-in cycles.
Environmental Data	
Max. operational speed	800 rpm
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	IP54 / IP65 / IP67
Operating temperature	-40 ... +85°C -25 ... +85°C (connector M12)
Insensitivity to magnetic DC fields	< 15 mT
Life	> 50 Mio. movements (mechanically)
Functional safety	If you need assistance in using our products in safety-related systems, please contact us
MTTF (IEC 60050)	591 years
Traceability	Serial number on type labeling: production batch of the sensor assembly and relevant sensor components
Conformity/Approval	

EMC Compatibility	
IO-Link Interface and System	V1.1.3
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)	2 kV
EN 61000-4-6 Cond. disturbances (HF fields)	10 V eff.
EN 55016-2-3 Radiated disturbances	Industrial and residential area

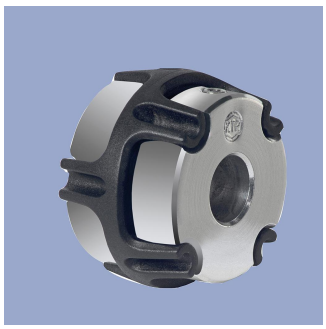
Important:
While operation, care should be taken not to rotate the sensor shaft below 0° or above 15840°. Refer to users manual.
FS = Full scale: Signal span according to electrical measuring range

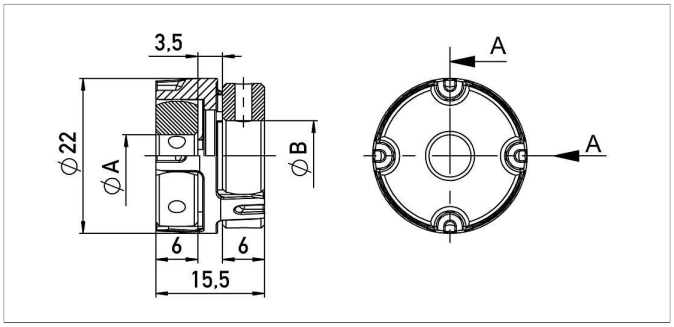
Connection Assignment

Signal	Cable code 2_ _	Connector code 5_ _
Supply voltage Ub (L+)	BN	Pin 1
GND (L-)	WH	Pin 3
C/Q	YE	Pin 4
Do not connect (alt. GND)	GN	Pin 2



Sensor Mounting



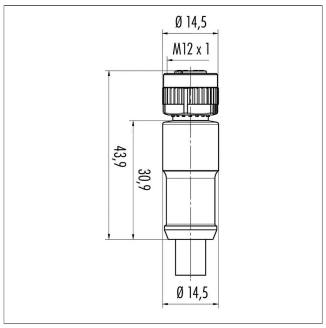


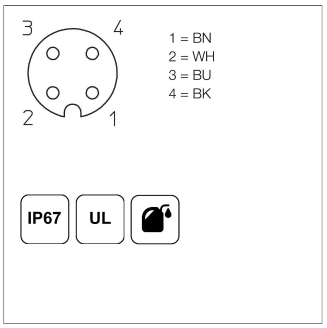
Z-106-G-_
Backlash-free, double cardanic shaft coupling for Ø6 mm to Ø6 mm, Ø6.35 mm or Ø10 mm, mounting via 2 threaded pins with internal hexagon

Material	Aluminium, PEEK
Operating temp.	-40 ... +160°C
Transferable torque	≤ 1 Nm
Displacement	rad. ≤ 0.1 mm, angl. ≤ 0.45°

P/N	Type	ØA / ØB [mm]
400103910	Z-106-G-6	6 / 6
400103912	Z-106-G-6,35	6 / 6.35
400103913	Z-106-G-10	6 / 10

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

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