

**NOVOHALL  
Rotary Sensor  
Touchless**

**RFE-3200  
CAN SAE J1939  
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 SS 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

**Interface**

**J: CAN SAE J1939**

**Interface parameters**

**Single-channel version**

**1: 1x position, 1x speed, 1x revolution counter**

**5: 1x position, 1x speed, 1x revolution counter with bus termination 120 Ω**

**Dual-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**

**R F E - 3 2 0 1 - 2 1 4 - J 1 4 - 5 2 1**

Series

Mechanical version  
3201: Standard design

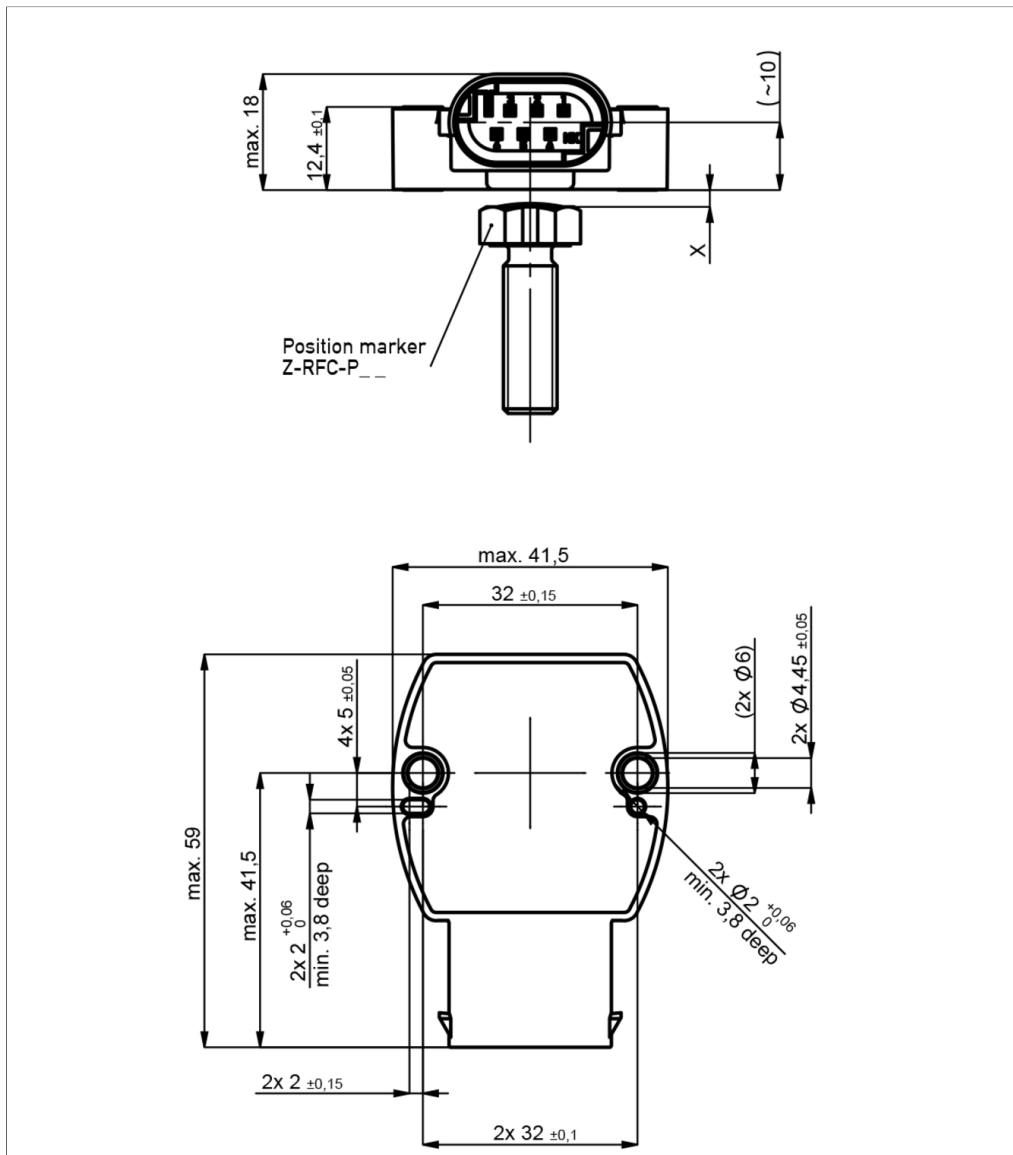
Resolution  
14: 14 bits

Interface  
2: Digital Interface

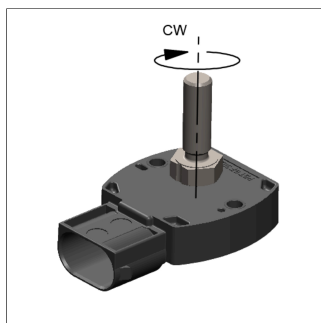
### Accessories included in delivery

- 2x Pan head screws M4x18

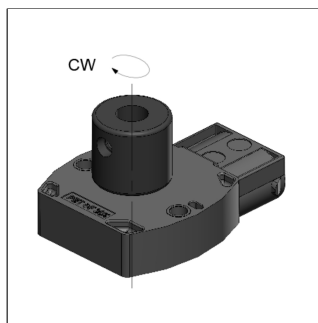
**Drawing**



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



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



Only Z-RFC-P23/43:  
When the marking of the position marker is pointing away from the connector, the sensor is near the electrical center position (index position).

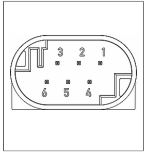
## Technical Data

<b>Type</b>	<b>RFE-32_-214-J_-_-_-_-</b> <b>CAN SAE J1939</b>
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 U <sub>b</sub>	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)
<b>Environmental Data</b>	
Max. operational speed	Mechanically unlimited
Vibration IEC 60068-2-6	20 g, 5 ... 2000 Hz, A <sub>max</sub> = 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	CE, UKCA see <a href="https://www.novotechnik.de/en/downloads/certificates/declarations-of-conformity-eu/uk">https://www.novotechnik.de/en/downloads/certificates/declarations-of-conformity-eu/uk</a> WEEE see <a href="https://www.novotechnik.de/en/downloads/certificates/eu-directive-weee/">https://www.novotechnik.de/en/downloads/certificates/eu-directive-weee/</a>
<b>EMC Compatibility</b>	
ISO 10605 ESD (Handling/Component)	8 kV
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

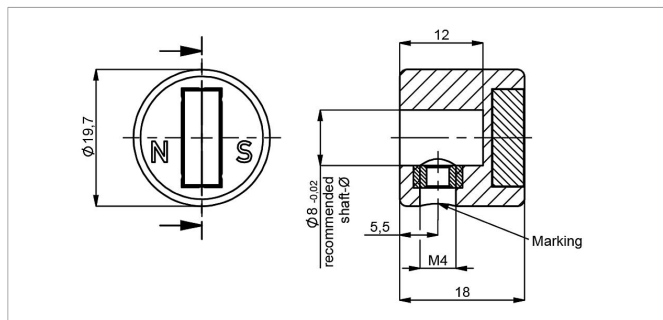
FS = Full scale: Signal span according to electrical measuring range

**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!

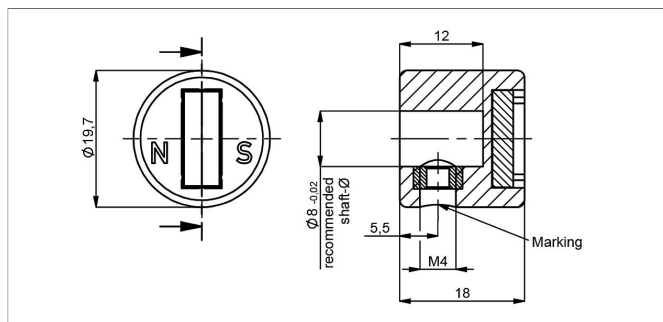
Material PA6-GF

Max. permitted  $\pm 3$  mm

radial offset

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

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



### Z-RFC-P43

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

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

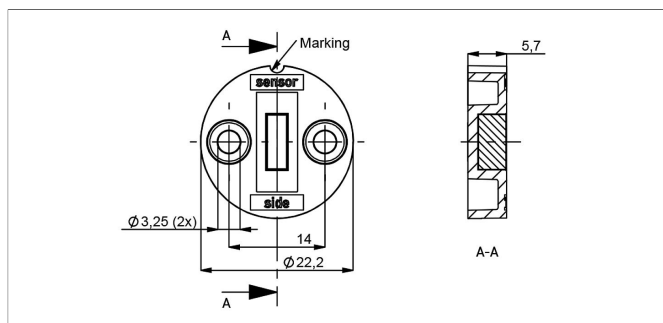
Material PA6-GF

Max. permitted  $\pm 3$  mm

radial offset

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

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



### Z-RFC-P30

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

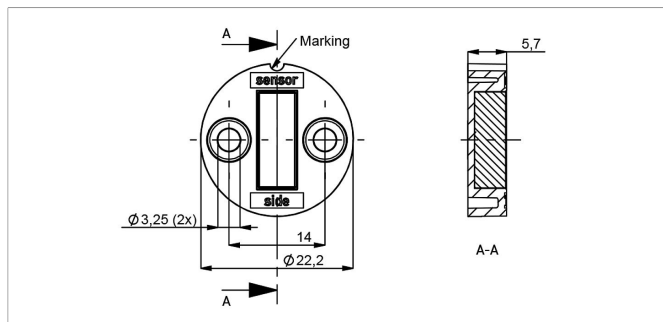
Material PBT-GF

Max. permitted  $\pm 1.5$  mm

radial offset

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

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



### Z-RFC-P31

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

Material PBT-GF

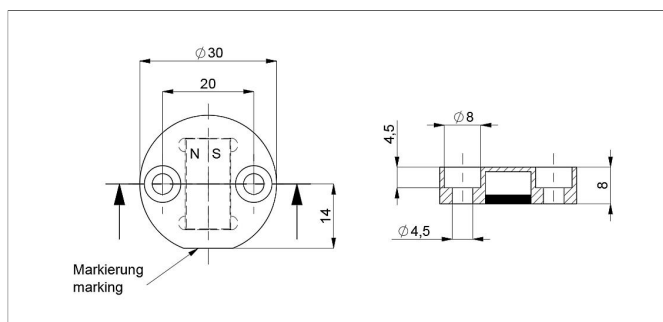
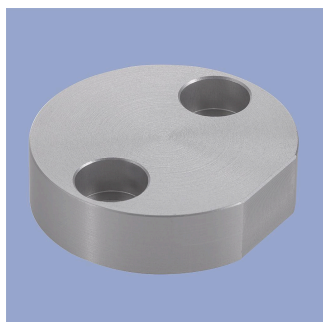
Max. permitted  $\pm 3$  mm

radial offset

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

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

## Position Markers



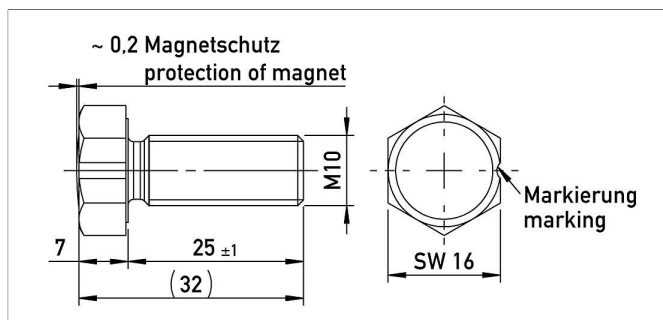
### Z-RFC-P22

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

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

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

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

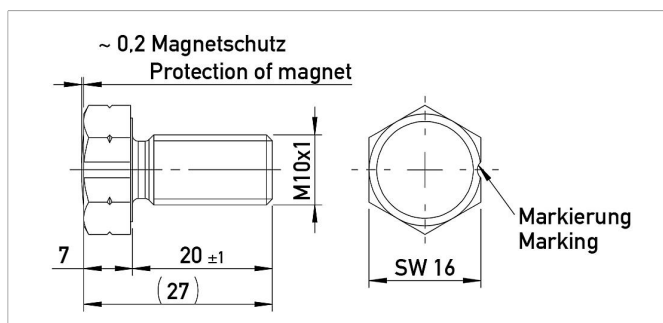


### Z-RFC-P18

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

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

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

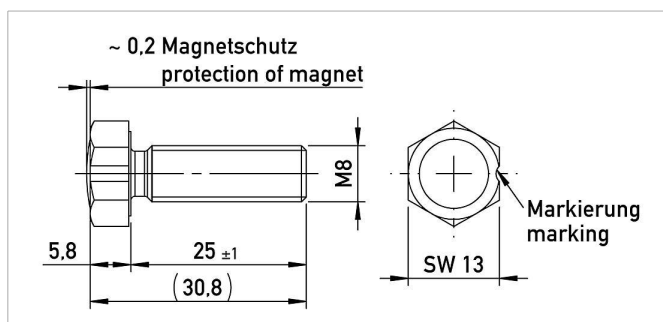


### Z-RFC-P28

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

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

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



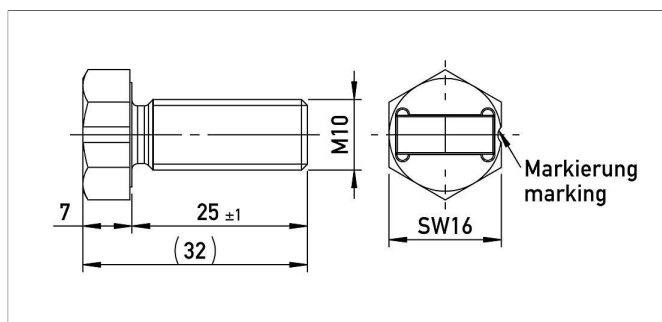
### Z-RFC-P19

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

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

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

## Position Markers



### Z-RFC-P20

Screw position marker M10 x 25 mm, similar DIN 933

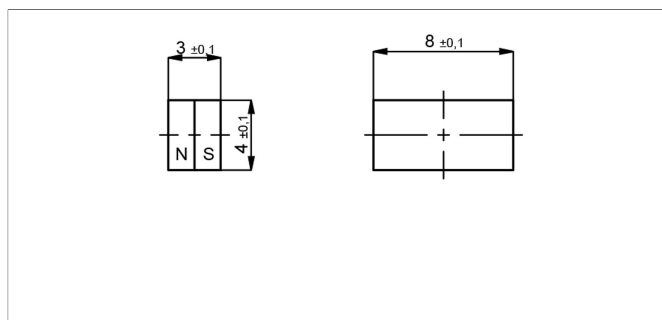
Material Aluminium, anodized

Max. permitted radial offset ± 3 mm

radial offset

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).

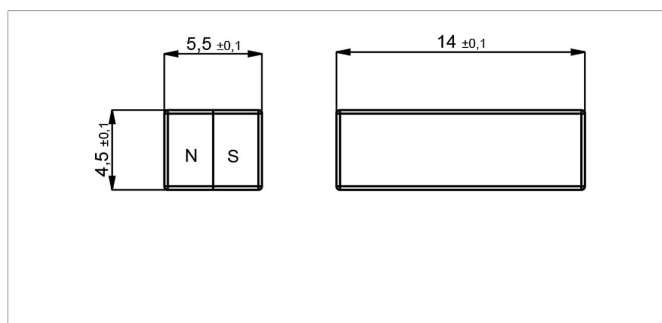
We recommend mounting on non-magnetizable materials, otherwise the specified working distances will vary (e.g. reduction of approx. 20% with axial mounting on a magnetizable shaft).

Max. permitted radial offset ± 1.5 mm

radial offset

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

radial offset

Operating temp. -40 ... +125°C

P/N	Pack. unit [pcs]
400005659	1
400056082	50

## Position Markers

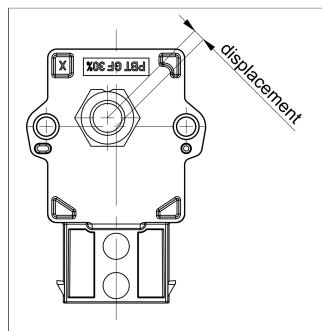
### Working Distances Position Markers [mm] - Single-channel Versions

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.

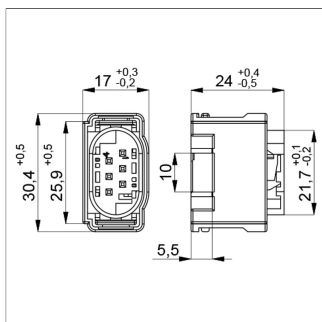
### Additional Linearity Error at Radial Displacement - Single-channel Versions

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

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

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

## Connector System MQS



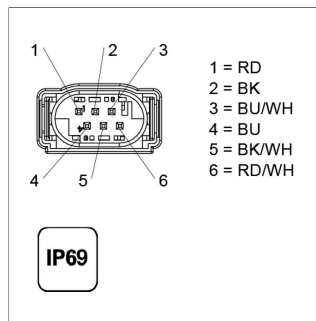
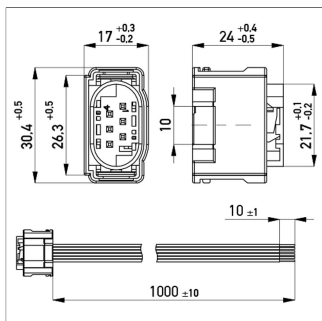
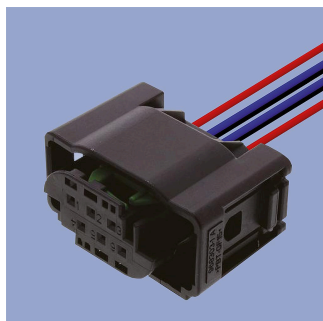
### EEM-33-34

Connector kit MQS System 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 mm<sup>2</sup> (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 mm<sup>2</sup>, PVC, 1 m, open ended

Operating temp. -40 ... +120°C

Lead wires PVC, 6x0.5 mm<sup>2</sup>

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

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