NOVOHALL
Rotary Sensor
Touchless
RFX-6900
Heavy Duty
CANopen
Mobile Applications

Special Features
• Very robust design for extreme environments
• Touchless hall technology
• Electrical range up to 360°, in single and dual-channel version
• 2 part design, mechanically decoupled
• Enhanced corrosion protection due to anodized aluminum housing, salt spray resistant
• Excellent linearity
• High resolution to 14 bits
• Absolutely impermeable to splash-water IP69K
• High temperature resistance
• For highest EMC requirements such as ISO pulses and interference fields according to ISO 11452 and ECE directive

Applications
• Position measurement in steering systems
• Pivotable vehicle bracings
• Transport systems with several steered axes
• Construction and agricultural machinery

The angle sensor RFX-6900 is designed for use in mobile applications under extreme environmental conditions. The sensor is suitable for a continuously ambitious operating.

The two-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: aluminium AlMgSi1, anodized, salt spray resistant

Mounting
With 3 screws M4, screw-in depth 7 mm min.

Fastening torque of mounting
250 ± 50 Ncm

Electrical connection
Cable with cable screw connection, 4x 0.5 mm² (AWG 20), TPE, shielded / Connector M12x1, A-coded

Mechanical Data
Dimensions
See dimension drawing

Mechanical travel
Continuous

Weight
approx. 200 g
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

Single-channel version
1: 1x position, 1x speed
6: 1x position, 1x speed with bus termination 120 Ohm

Dual-channel version
2: 2x position, 2x speed
6: 2x position, 2x speed with bus termination 120 Ohm

Baud rate
1: 1000 kBit/s
2: 800 kBit/s
3: 500 kBit/s
4: 250 kBit/s
5: 125 kBit/s
7: 50 kBit/s

Electrical connection
1 Output
201: 1x cable 4-pole 1.0 m, shielded
611: 1x connector M12, 5-pole, shielded

2 Outputs (CAN IN/OUT)
301: 2x cable 4-pole 1.0 m, shielded
611: 2x connector M12 (male), 5-pole, shielded

Cable versions and assembled connectors on request

<table>
<thead>
<tr>
<th>R</th>
<th>F</th>
<th>X</th>
<th>6</th>
<th>9</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>1</th>
<th>4</th>
<th>6</th>
<th>1</th>
<th>5</th>
<th>5</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
</table>

Series Model / size
6901: 69 x 20.4 mm
When the marking of the position marker is pointing towards the electrical outlet or to the indexing, the sensor output is near the electrical center position.
**Type**

- RFX-69_ _-214-6_ _-_ _ _
  - CANopen

**Measured variables**
- Position and speed

**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

**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

**Independent linearity**
- ±0.5 %FS

**Repeatability**
- ±0.1°

**Hysteresis**
- ±0.1°

**Temperature error**
- ±0.2 %FS

**Supply voltage Ub**
- 12/24 VDC (12 ... 34 VDC)

**Power drain w/o load**
- < 0.4 W

**Overvoltage 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)

**Max. operational speed**
- Mechanically unlimited

**Vibration IEC 60068-2-6**
- 20 g, 5 ... 2000 Hz, Amax = 0.75 mm

**Shock IEC 60068-2-27**
- 50 g, 6 ms

**Protection class DIN EN 60529**
- IP67 / IP69K (connector M12: IP67)

**Operating temperature**
- -40 ... +105°C

**Functional safety**
- If you need assistance in using our products in safety-related systems, please contact us

**MTTF (IEC 60050)**
- 413 years (one-channel) or 303 years (two-channel, per channel)

**Traceability**
- Serial number on type labeling: production batch of the sensor assembly and relevant sensor components

**Conformity/Approval**
- WEEE see https://www.novotechnik.de/en/downloads/certificates/eu-directive-weee/

**EMC Compatibility**
- ISO 10605 ESD (Handling/Component) 8 kV
- ISO 11452-2 Radiated HF-fields 100 V/m
- ISO 11452-5 Radiated HF-Fields, stripe 200 V/m
- CISPR 25 Radiated emission Level 4
- ISO 7637-1 Pulsess on supply lines 11, 2A, 2B, 3A, 3B, 4, 5 Level 3
- ISO 7637-3 Pulsess on output lines Level 4
- 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

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code</th>
<th>Connector code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage UB</td>
<td>BN</td>
<td>Pin 2</td>
</tr>
<tr>
<td>GND</td>
<td>WH</td>
<td>Pin 3</td>
</tr>
<tr>
<td>CAN_H</td>
<td>GN</td>
<td>Pin 4</td>
</tr>
<tr>
<td>CAN_L</td>
<td>YE</td>
<td>Pin 5</td>
</tr>
<tr>
<td>CAN_SHLD</td>
<td>Shield</td>
<td>Pin 1</td>
</tr>
</tbody>
</table>

- Connect cable shielding to GND.
Position Markers

### Z-RFC-P02
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock) or with locking pin (both included in delivery).
- **Material**: PF
- **Max. permitted radial offset**: ± 3 mm
- **Operating temp.**: -40 ... +125°C

<table>
<thead>
<tr>
<th>P/N</th>
<th>Pack. unit [pcs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>400005661</td>
<td>1</td>
</tr>
<tr>
<td>400056080</td>
<td>25</td>
</tr>
</tbody>
</table>

### Z-RFC-P08
Position marker for fixation with threaded pin M5 (included in delivery).
- **Material**: PF
- **Max. permitted radial offset**: ± 3 mm
- **Operating temp.**: -40 ... +125°C

<table>
<thead>
<tr>
<th>P/N</th>
<th>Pack. unit [pcs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>400056070</td>
<td>1</td>
</tr>
<tr>
<td>400056084</td>
<td>25</td>
</tr>
</tbody>
</table>

### Z-RFC-P23
Position marker for fixation with threaded pin M4 (included in delivery)
- **Material**: PA6-GF
- **Max. permitted radial offset**: ± 3 mm
- **Operating temp.**: -40 ... +125°C

### 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

<table>
<thead>
<tr>
<th>P/N</th>
<th>Pack. unit [pcs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>400056074</td>
<td>1</td>
</tr>
<tr>
<td>400056085</td>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P/N</th>
<th>Pack. unit [pcs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>400056088</td>
<td>1</td>
</tr>
<tr>
<td>400056089</td>
<td>25</td>
</tr>
</tbody>
</table>
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-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
Position Markers

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

<table>
<thead>
<tr>
<th>P/N</th>
<th>Pack. unit [pcs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>400005669</td>
<td>1</td>
</tr>
<tr>
<td>400056082</td>
<td>50</td>
</tr>
</tbody>
</table>

Z-RFC-S01/S02/S03
Shaft adapter for fixation at position marker Z-RFC-P02/P41 with locking pin
Material SS 1.4305 / AISI 303

<table>
<thead>
<tr>
<th>P/N</th>
<th>Type ØB / A [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>400056206</td>
<td>Z-RFC-S01 6 / 4.5</td>
</tr>
<tr>
<td>400056207</td>
<td>Z-RFC-S02 8 / 6.5</td>
</tr>
<tr>
<td>400056208</td>
<td>Z-RFC-S03 10 / 8.5</td>
</tr>
</tbody>
</table>
Position Markers

Working Distances Position Markers [mm] - Redundant Versions

<table>
<thead>
<tr>
<th></th>
<th>Z-RFC-P02 / P04 / P08</th>
<th>Z-RFC-P18 / P28</th>
<th>Z-RFC-P22</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3 ... 3.5</td>
<td>0 ... 2.5</td>
<td>2.6 ... 7.3</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Z-RFC-P02 / P04 / P08</th>
<th>Z-RFC-P18 / P28</th>
<th>Z-RFC-P22</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 mm: ±0.4°</td>
<td>0.5 mm: ±0.7°</td>
<td>1.0 mm: ±0.8°</td>
<td></td>
</tr>
<tr>
<td>1.0 mm: ±1.1°</td>
<td>1.0 mm: ±1.3°</td>
<td>2.0 mm: ±1.8°</td>
<td></td>
</tr>
<tr>
<td>2.0 mm: ±3.5°</td>
<td>2.0 mm: ±3.3°</td>
<td>4.0 mm: ±5.4°</td>
<td></td>
</tr>
</tbody>
</table>

Additional Linearity Error at Radial Displacement - Redundant Versions

<table>
<thead>
<tr>
<th></th>
<th>Z-RFC-P02 / P04 / P08</th>
<th>Z-RFC-P18 / P28</th>
<th>Z-RFC-P22</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 mm: ±0.7°</td>
<td>0.5 mm: ±1.1°</td>
<td>1.0 mm: ±1.1°</td>
<td></td>
</tr>
<tr>
<td>1.0 mm: ±1.8°</td>
<td>1.0 mm: ±2°</td>
<td>2.0 mm: ±2.4°</td>
<td></td>
</tr>
<tr>
<td>2.0 mm: ±5.2°</td>
<td>2.0 mm: ±4.6°</td>
<td>4.0 mm: ±6.7°</td>
<td></td>
</tr>
</tbody>
</table>
Sensor Mounting

Z-RFX-M01
Mounting plate for adjustable mounting on screw-hole circle 90 mm. Assembly material (6x countersink screws) included in delivery

Material: Aluminium, anodized

P/N  Type
400104278  Z-RFX-M01
Connector System
M12

**EEM-33-41/43**
M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded, open ended, CAN-Bus
Plug housing: PUR
Cable sheath: PUR, Ø = 7.2 mm, 25 ... +85°C (fixed)
Lead wires: P: 2x0.25 mm² + 2x0.34 mm²
P/N | Type | Length |
--- | --- | --- |
400056141 | EEM-33-41 | 2 m |
400056143 | EEM-33-43 | 10 m |

**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 ... +90°C (cable)
Lead wires: PE, 2x0.25 mm² + 2x0.34 mm²
P/N | Type | Length |
--- | --- | --- |
400106373 | EEM-33-52 | 5 m |

**EEM-33-73**
M12x1 Mating female connector, 5-pin, angled, 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-33-75**
M12x1 mating female connector, 5-pin, angled, A-coded, with coupling nut, screw termination, IP67, shieldable, CAN bus, turning and fixing of contact carrier in 90° positions possible.
Plug housing: Metal, -40 ... +85°C
For wire gauge: 6 ... 8 mm, max. 0.75 mm²
P/N | Type |
--- | --- |
400005646 | EEM-33-75 |
The specifications contained in our datasheets are intended solely for informational purposes. The documented specification values are based on ideal operational and environmental conditions and can vary significantly depending on the actual customer application. Using our products at or close to one or more of the specified performance ranges can lead to limitations regarding other performance parameters. It is therefore necessary that the end user verifies relevant performance parameters in the intended application. We reserve the right to change product specifications without notice.