NOVOHALL
 Rotary Sensor
touchless transmissive
Series RFX-6900

Special features
• Very robust design to extreme environmental conditions
• Touchless hall technology
• Electrical range up to 360°, in single and multi-channel version
• 2-part, mechanically decoupled
• Enhanced corrosion protection by anodized aluminum housing, salt spray resistant
• Very good linearity
• Resolution 12 bit
• Absolutely impermeable to splash-water IP6K9K
• High temperature resistance
• Suitable for use in safety-related applications according to ISO 13849
• For highest EMC requirements such as ISO pulses and interference fields according to ISO 11452 and ECE directive
• Customized versions

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

Description
<table>
<thead>
<tr>
<th>Housing</th>
<th>Anodized aluminum, salt spray resistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical connections</td>
<td>Cable 4 x 0.5 mm², AWG 20, TPE, unshielded or connector M12x1, 4-pole</td>
</tr>
</tbody>
</table>
Inhalt

<table>
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<th>Page</th>
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<tr>
<td>M8 Connector System</td>
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</tr>
</tbody>
</table>
Mechanical Data

Dimensions: see dimension drawing

Mounting:
- with 3 screws M4, screwing min. 7 mm

Fastening torque of mounting screws: 2.5 ±0.5 Nm

Mechanical travel: 360° continuous

Maximum operational speed: mechanical unlimited

Weight (without connection): approx. 200 g

Environmental Data:
- Operating temperature: -40...+85°C
- Vibration IEC 60068-2-6: 5...2000 Hz, Amax = 0.75 mm, amax = 20 g
- Shock IEC 60068-2-27: 50 (6 ms) g
- Protection class (DIN EN 60529): IP67 connector output M12, IP6K9K cable output

CAD data see www.novotechnik.de/en/downloads/cad-data/
One channel, cw

Crossed characteristics, channel 1 cw

On request:
Trapeze characteristic

On request:
2 staggered characteristics

On request:
Parabolic characteristic

One channel ccw

On request:
two channel, signal 2 = 0.5 x signal 1

On request:
different gradients

On request:
Parabolic characteristic
E lectrical Data

- **Output signal**: 4...20 (burden max. 250 Ω, higher on request) mA
- **Number of channels**: 1 / 2
- **Update rate**: 5 kHz
- **Resolution**: 12 Bit
- **Measuring range**: 60, 120, 180, 240, 300, 360°
- **Independent linearity**: 0.5 ±%FS
- **Interlinearity channel 1 to channel 2 at measuring range < 90°**: 4.0 ±%FS
- **Interlinearity channel 1 to channel 2 at measuring range ≥ 90°**: 2.0 ±%FS
- **Repeatability**: 0.2°
- **Hysteresis at measuring range < 360°**: 0.1°
- **Hysteresis at measuring range > 90°**: 0.25° (lower hysteresis on request)
- **Temperature error at measuring range < 90°**: 200 ppm/K
- **Temperature error at measuring range ≥ 90°**: 160 ppm/K
- **Supply voltage Ub**: 12/24 (9...34) VDC
- **Current consumption (w/o load)**: typical 20 per channel, supply voltage Ub = 24 V mA
- **Reverse voltage**: yes
- **Short circuit protection**: yes, all outputs vs. GND and Ub
- **Insulation resistance (500 VDC)**: ≥ 10 MΩ
- **Cross-section cable**: 0-5 (AWG 20) mm²

E nvironmental Data

- **EMC compatibility**:
  - ISO 10605 Packaging und Handling + Component Test (ESD) 8 kV, 15 kV
  - ISO 11452-2 Radiated EM HF-fields, Absorber hall 100 V/m
  - ISO 11452-5 Radiated EM HF-fields, stripline 200 V/m
  - CISPR 25 Radiated Emission, class 5
  - ISO 7637-2 Pulse 1, 2a, 2b, 3a, 3b, 4, 5 SG 4
  - ISO 7637-3 Transient emission, SG 4
  - Interference emission and immunity according to ECE-R10 (E1)
- **Functional safety**: Suitable for safety-relevant applications according to ISO 13849 after customer validation. Further safety data and support for functional safety are available on request.

F ully redundant version

- **Supply Ub 1**: Channel 1 / GN
- **GND 1**: Channel 1 / BN
- **Signal 1**: Channel 1 / WH
- **Supply Ub 2**: Channel 2 / GN
- **GND 2**: Channel 2 / BN
- **Signal 2**: Channel 2 / YE
- **not assigned**: Channel 1 / YE, Channel 2 / WH

Single channel version

- **Supply Ub**: Channel 1 / GN
- **GND**: Channel 1 / BN
- **Signal**: Channel 1 / WH
- **Not assigned**: Channel 1 / YE

Partly redundant version

- **Supply Ub**: Channel 1 / GN
- **GND**: Channel 1 / BN
- **Signal 1**: Channel 1 / WH
- **Signal 2**: Channel 1 / YE

MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc)

- 46 (per channel) years
- 92 (per channel) years

## Ordering Specifications

**Analog Interface - Current**

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

### Supply Ub / interface

| 3: Ub = 12/24 V (9 ... 34 V) |

### Output signal

| 2: 4 mA ... 20 mA |

### Output characteristic

1: rising CW
2: rising CCW
3: Partly redundant version: crossed output channel 1 rising / channel 2 falling CW
4: Fully redundant version: crossed output channel 1 rising / channel 2 falling CW

Other characteristics on request

### Electrical connection

- Single channel / partly redundant version: 1 output
  - 252: 1 x cable 4-pole, 2 m, unshielded
  - 551: 1 x connector M12, 4-pin, unshielded
- Fully redundant version: 2 outputs
  - 352: 2 x cable 4-pole, 2 m, unshielded
  - 651: 2 x connector M12, 4-pin, unshielded

Cable versions and assembled connectors on request

### Measuring range

<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>8</th>
<th>3</th>
<th>6</th>
<th>3</th>
<th>2</th>
<th>4</th>
<th>3</th>
<th>5</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series</td>
<td>Measuring range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>06: 60°</td>
<td>12: 120°</td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>18: 180°</td>
<td>24: 240°</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>30: 300°</td>
<td>36: 360°</td>
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<tr>
<td>Other angles on request</td>
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</tr>
</tbody>
</table>

### Number of channels

- 6: single channel version (1 x Ub, 1 x output)
- 7: partly redundant version (1 x Ub, 2 x output)
- 8: fully redundant version (2 x Ub, 2 x output)

### Model / size

| Model / size |
| 6901: 69 x 20.4 mm |
## Technical Data

### Type Designations
- **RFX-69 _ _-214-6 _ _- _ _**
- **CANopen**

### Electrical Data

<table>
<thead>
<tr>
<th>Measured variables</th>
<th>Position and speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>360°</td>
</tr>
<tr>
<td>Measurement range speed</td>
<td>0 ... 1600 min⁻¹</td>
</tr>
<tr>
<td>Number of channels</td>
<td>1 / 2</td>
</tr>
</tbody>
</table>

#### Output signal / 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 parameter
- Position, speed, cams, working areas, rotating direction, scale, offset, node-ID, baud rate

<table>
<thead>
<tr>
<th>Node-ID</th>
<th>1 ... 127 (default 127)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>50 ... 1000 kBaum</td>
</tr>
<tr>
<td>Resolution across 360°</td>
<td>14 bit</td>
</tr>
<tr>
<td>Resolution speed</td>
<td>360/2°/ = 5.022 °/ ms</td>
</tr>
<tr>
<td>Update rate</td>
<td>1 °/ ms</td>
</tr>
<tr>
<td>Independent Linearity</td>
<td>± 0.5 ±/% FB</td>
</tr>
<tr>
<td>Repeatability</td>
<td>± 0.36 ±/% FB</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>± 0.36 ±/% FS</td>
</tr>
<tr>
<td>Temperature error</td>
<td>0.2 ±/% FS</td>
</tr>
<tr>
<td>Supply voltage Ub</td>
<td>12/24 (8 ... 36) VDC</td>
</tr>
<tr>
<td>Current consumption</td>
<td>&lt; 100 mA</td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>yes, supply lines</td>
</tr>
<tr>
<td>Short circuit protection</td>
<td>yes, output vs. GND and supply voltage Ub (up to 40 VDC)</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>&lt; 45 (permanent) VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>≥ 10 MΩ</td>
</tr>
<tr>
<td>Cross-section cable</td>
<td>0.5 (AWG 20) mm²</td>
</tr>
<tr>
<td>Bus termination internal</td>
<td>120, optionally Ω</td>
</tr>
<tr>
<td>Environmental Data</td>
<td></td>
</tr>
</tbody>
</table>

| Operation temperature    | -40 ... +105 (-25 ... +85 with M12 connector) °C |
| MTTF (DIN EN ISO 13849-1 parts count method, w/o load, w/c) | one-channel: 71 / two-channel: 58 (per channel) years |

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

### EMC compatibility
- ISO 10605 Packaging and Handling + Component Test 8 kV
- ISO 11452-2 Radiated EM RF fields, Absorberhall 100 V/m
- ISO 11452-5 Radiated EM RF fields, Stripline 200 V/m
- CISPR 25: Radiated emission class 3
- ISO 7637-2 Pulse 1, 2a, 2b, 3a, 3b, 4, 5 SG 3
- ISO 7637-3 Transient transmission SG 4
- EN 13309 Construction machinery
- Interference emission and immunity according to ECE-R10 (E1)

### Connection assignment

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable Code 2 _ _ / 3 _ _</th>
<th>Connector M12 Code 5 _ _ / 6 _ _</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN_SHLD</td>
<td>Shield</td>
<td>pin 1</td>
</tr>
<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>
</tbody>
</table>

Cable shielding connect to GND.
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

Interface parameters CANopen 6
1: 1 x position, 1 x speed
2: 2 x position, 2 x speed
5: 1 x position, 1 x speed with bus termination 120 Ω
6: 2 x position, 2 x speed with bus termination 120 Ω

Interface parameters IO-Link A
11: 1 x position, rising cw

Other process data such as speed, revolution counter or cams on request

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

Electrical connection
1 Output
201: 1 x cable 4-pole 1.0 m, shielded
511: 1 x connector M12, 5-pole, shielded
2 Outputs (CAN IN/OUT)
301: 2 x cable 4-pole 1.0 m, shielded
611: 2 x connector M12, 5-pole, shielded

Series
Model / size
6901: 69 x 20.4 mm
### Z-RFC-P02
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with microencapsulation) or with locking pin (both included in delivery)
- max. permitted radial offset ±3 mm
- packaging unit:
  - 1 pc. P/N 400005670
  - 25 pcs. P/N 400056080

### Z-RFC-P08
Position marker for fixation with threaded pin M5 (included in delivery)
- max. permitted radial offset ±3 mm
- packaging unit:
  - 1 pc. P/N 400005680
  - 25 pcs. P/N 400056084

### Z-RFC-P18
Screw position marker M10 x 25 mm, similar DIN 933, anodized aluminum, magnet potted
- max. permitted radial offset ±3 mm
- packaging unit:
  - 1 pc. P/N 400104750
  - 25 pcs. P/N 400104758

### Z-RFC-P20
Screw position marker M10 x 25 mm, similar DIN 933, anodized aluminum
- max. permitted radial offset ±3 mm
- packaging unit:
  - 1 pc. P/N 400104758
  - 25 pcs. P/N 400104759
Z-RFX-M01
Mounting plate for adjustable mounting on screw-hole 90 mm
• aluminum, anodized
• P/N 400056202
Assembly material (3 x countersink screw) included in delivery

Z-RFC-P04
Magnet for direct application onto customer's shaft
• max. permitted radial offset ±3 mm
• packaging unit:
  1 pc. P/N 400056074
  50 pcs. P/N 400056082

Z-RFC-P23
Position marker for fixation with threaded pin M4 (included in delivery)
• max. permitted radial offset ±3 mm
• packaging unit:
  1 pcs. P/N 400056074
  100 pcs. P/N 400056085

Z-RFC-S01 / Z-RFC-S02 / Z-RFC-S03
Shaft adapter for Z-RFC-P02. Fixation at position marker with locking pin.
• Z-RFC-S01: Ø 6 mm, P/N 400056206
• Z-RFC-S02: Ø 8 mm, P/N 400056207
• Z-RFC-S03: Ø 10 mm, P/N 400056208
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 type.

### Working distances (mm)

<table>
<thead>
<tr>
<th>Interfaces</th>
<th>Z-RFC-P02 / P04 / P08 / P20 / P23</th>
<th>Z-RFC-P18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog (current)</td>
<td>0.3 ... 3.5</td>
<td>0 ... 2.5</td>
</tr>
<tr>
<td>CANopen one-channel</td>
<td>0.8 ... 4</td>
<td>0 ... 3</td>
</tr>
<tr>
<td>CANopen two-channel</td>
<td>0.3 ... 3.5</td>
<td>0 ... 2.5</td>
</tr>
</tbody>
</table>

**Mounting instructions Z-RFC-P04**
- In general, we recommend mounting on not magnetizable materials, otherwise the stated working distances can change.
- If the shaft is magnetizable please keep sufficient distance.
- When the magnet is mounted in the shaft, the shaft may not be magnetizable.
- If the magnet is axially fixed on a magnetizable shaft the working distances reduces by approx. 20%.

### Lateral magnet offset

<table>
<thead>
<tr>
<th>Interface</th>
<th>Z-RFC-P02 / P04 / P08 / P20 / P23</th>
<th>Z-RFC-P18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog (current)</td>
<td>0.7 1.1 2.2</td>
<td>1.1 2.0 4.6</td>
</tr>
<tr>
<td>CANopen one-channel</td>
<td>0.4 1.1 3.5</td>
<td>0.7 1.3 3.3</td>
</tr>
<tr>
<td>CANopen two-channel</td>
<td>0.7 1.1 2.2</td>
<td>1.1 2.0 4.6</td>
</tr>
</tbody>
</table>
Accessories
Connector System M12

M12x1 Mating female connector, 4-pin, straight, A-coded, with coupling nut, screw termination, IP67, not shielded

<table>
<thead>
<tr>
<th>Connector housing</th>
<th>Plastic PBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>For wire gauge</td>
<td>6...8 mm, max. 0.75 mm²</td>
</tr>
<tr>
<td>Type</td>
<td>EEM 33-88, P/N 400056633</td>
</tr>
</tbody>
</table>

M12x1 Mating female connector, 4-pin, angled, A-coded, with coupling nut, screw termination, IP67, not shielded

<table>
<thead>
<tr>
<th>Connector housing</th>
<th>Plastic PBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>For wire gauge</td>
<td>6...8 mm, max. 0.75 mm²</td>
</tr>
<tr>
<td>Type</td>
<td>EEM 33-89, P/N 400056634</td>
</tr>
</tbody>
</table>

M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, not shielded, IP67, open ended

<table>
<thead>
<tr>
<th>Connector housing</th>
<th>Plastic PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable sheath</td>
<td>PUR; Ø = max. 6 mm, -40 °C...+85 °C (flexible)</td>
</tr>
<tr>
<td>Wires</td>
<td>PP, 0.34 mm²</td>
</tr>
<tr>
<td>Length</td>
<td>Type</td>
</tr>
<tr>
<td>2 m</td>
<td>EEM 33-35</td>
</tr>
<tr>
<td>5 m</td>
<td>EEM 33-36</td>
</tr>
<tr>
<td>10 m</td>
<td>EEM 33-37</td>
</tr>
</tbody>
</table>

M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, not shielded, IP67, open ended

<table>
<thead>
<tr>
<th>Connector housing</th>
<th>Plastic PA</th>
</tr>
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<tbody>
<tr>
<td>Cable sheath</td>
<td>PUR; Ø = max. 6 mm, -40 °C...+85 °C (flexible)</td>
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<td>Wires</td>
<td>PP, 0.34 mm²</td>
</tr>
<tr>
<td>Length</td>
<td>Type</td>
</tr>
<tr>
<td>2 m</td>
<td>EEM 33-38</td>
</tr>
<tr>
<td>5 m</td>
<td>EEM 33-39</td>
</tr>
<tr>
<td>10 m</td>
<td>EEM 33-40</td>
</tr>
</tbody>
</table>
**Accessories**

**Connector System M12**

**M12x1 Mating female connector, 5-pin, straight, A-coded, with coupling nut, screw termination, IP67, shielded, CAN-Bus**

- **Connector housing**: Metal
- **Temperature range**: -40 °C...+85 °C
- **For wire gauge**: 6...8 mm², max. 0.75 mm²

**Type**: EEM 33-73, P/N 005645

**Pin assignment**

1 = shield
2 = red (0.34 mm²)
3 = black (0.34 mm²)
4 = white (0.25 mm²)
5 = blue (0.25 mm²)

**Length**

- 2 m: EEM 33-41, P/N 056141
- 5 m: EEM 33-42, P/N 056142
- 10 m: EEM 33-43, P/N 056143

**Protection class to DIN EN 60529**

Schutzart IP67 nach DIN EN 60529

**Very good Electromagnetic Compatibility (EMC) and shield systems**

**Note:** The protection class is valid only in locked position with its plugs. The application of these products in harsh environments must be checked in particular cases.
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.