NOVOHAL Rotory Sensor Touchless
RFC-4800 Incremental
Mobile Applications

Special Features
• Touchless hall technology
• Electrical range 360°
• 2 part design, mechanically decoupled
• Wear-free
• High protection class IP67, IP68, IP69
• Resolution up to 12 bits
• Temperature range -40 °C to +85 °C
• For very high rotational speeds
• 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
Mounting
With 2 pan head screws M4x20 (included in delivery)
Fastening torque of mounting
250 Ncm
Electrical connection
Laid wires 0.5 mm² (AWG 20), PVC / Connector M12x1, A-coded with cable L = 0.15 m / Cable 4x 0.5 mm² (AWG 20), TPE, unshielded

Mechanical Data
Dimensions
See dimension drawing
Mechanical travel
continuous
Weight (w/o connection)
approx. 50 g
Ordering Specifications

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

Ordering
Specifications

Accessories included in delivery
• 2x Pan head screws M4x20

Interface

6: Incremental Interface A / B / Z

Interface parameters
Low Speed Mode (minimum edge separation 8 µs)
66: 12/24 VDC supply voltage, output low side, open collector
UAV signals instead of A2Z signals for motor commutation on request
Absolute position at Power On (Power on Blast) 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
270: Cable 4-pole, unshielded, L = 10 m
411: Lead wire 4x L = 0.5 m
551: Connector M12x1, 4-pin, with cable, L = 0.15 m, unshielded
Cable versions and assembled connectors on request

Resolution
12: 1024 ppr - 4096 counts (after quadrature)
11: 512 ppr - 2048 counts (after quadrature)
10: 256 ppr - 1024 counts (after quadrature)
09: 128 ppr - 512 counts (after quadrature)
Other resolutions on request

Interface
2: Digital Interface

Series

4801: Elongated hole mounting
4802: Round hole mounting
Rotational direction CW: A leads before B.
### Technical Data

#### Type

**RFC-48-212-556-...**

**RFC-48-211-556-...**

**RFC-48-210-556-...**

**RFC-48-209-556-...**

**Incremental Open Collector**

<table>
<thead>
<tr>
<th>Outputs</th>
<th>A- / B-</th>
</tr>
</thead>
</table>

| Pulse per revolution | 1024 ppr | 512 ppr | 256 ppr | 128 ppr |
| Counts per revolution | 4096 after quadrature | 2048 after quadrature | 1024 after quadrature | 512 after quadrature |

- **Minimum edge separation**: 8 µs
- **Min. input frequency of counter input**: 32 kHz
  - Valid for 128 and 256 ppr: The requirement for the minimum input frequency of counter input is reduced at lower speed (see charts).
- **Max. operational speed**: 580 rpm, 3,500 rpm, 7,200 rpm, 14,400 rpm
- **Measuring range**: 360°
- **Independent linearity**: ≤ ±0.5 %FS
- **Repeatability**: ≤ ±0.2°
- **Hysteresis**: ≤ ±0.7°, lower hysteresis on request
- **Temperature error**: ≤ ±0.375 %FS
- **Supply voltage Ub**: 12/24 VDC (9 ... 34 VDC)
- **Current consumption w/o load**: typ. 10 mA
- **Overvoltage protection**: 60 VDC (10 min.)
- **Polarity protection**: yes (supply lines)
- **Short circuit protection**: yes (all outputs vs. GND and supply voltage)
- **Load outputs vs. supply voltage Ub**: 20 mA per channel
- **Insulation resistance (500 VDC)**: ≥ 10 MΩ

#### Environmental Data

- **Vibration** (IEC 60068-2-6): 20 g, 5 ... 2000 Hz, Amax = 0.75 mm
- **Shock** (IEC 60068-2-27): 50 g, 6 ms
- **Protection class DIN EN 60529**: IP67 / IP68 / IP69, IP67 (connector M12)
- **Operating temperature**: -40 ... +85°C, -25 ... +85°C (connector M12)
- **Life**: Mechanically unlimited

#### Functional safety

- If you need assistance in using our products in safety-related systems, please contact us.
- **MTTF (IEC 60050)**: 1154 years

#### 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: 200 V/m
- ISO 11452-5 Radiated HF-Fields, stripline: 200 V/m
- USNPR 25 Radiated emission: Level 5
- ISO 7637-2 Pulses on supply lines: (1): Level 3, (2a, 2b, 3a, 3b, 4, 5j) Level 4

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

#### Connection Assignment

<table>
<thead>
<tr>
<th>Signal</th>
<th>Lead wires code 4_ _</th>
<th>Connector code 5_ _</th>
<th>Cable code 2_ _</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-</td>
<td>BU</td>
<td>Pin 1</td>
<td>GN</td>
</tr>
<tr>
<td>Supply voltage Ub</td>
<td>RD</td>
<td>Pin 2</td>
<td>WH</td>
</tr>
<tr>
<td>GND</td>
<td>BK</td>
<td>Pin 3</td>
<td>BN</td>
</tr>
<tr>
<td>B-</td>
<td>BU/WH</td>
<td>Pin 4</td>
<td>YE</td>
</tr>
</tbody>
</table>
Technical Data

Protocol

Incremental protocol

Input Frequency at Counter Input

Connection

Sensor

U

R

I ≤ 20 mA

A

B

GND (0V)
### Position Markers

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Material</th>
<th>Max. permitted radial offset</th>
<th>Operating temp.</th>
<th>P/N</th>
<th>Pack. unit [pcs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-RFC-P02</td>
<td>Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock) or with locking pin (both included in delivery).</td>
<td>PF</td>
<td>±3 mm</td>
<td>-40 ... +125°C</td>
<td>400056061</td>
<td>1</td>
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<td></td>
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<td>400056080</td>
<td>25</td>
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<tr>
<td>Z-RFC-P08</td>
<td>Position marker for fixation with threaded pin M5 (included in delivery).</td>
<td>PF</td>
<td>±3 mm</td>
<td>-40 ... +125°C</td>
<td>400056070</td>
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<td>400056084</td>
<td>25</td>
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<tr>
<td>Z-RFC-P23</td>
<td>Position marker for fixation with threaded pin M4 (included in delivery).</td>
<td>PA6-GF</td>
<td>±3 mm</td>
<td>-40 ... +125°C</td>
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<tr>
<td>Z-RFC-P31</td>
<td>Position marker for frontal fixation with 2 cylinder screws M3x8 (included in delivery).</td>
<td>PBT-GF</td>
<td>±3 mm</td>
<td>-40 ... +125°C</td>
<td>400056088</td>
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<td>400056089</td>
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</tbody>
</table>

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[Image of Position Markers]
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>
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<tr>
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<tr>
<td>400056082</td>
<td>50</td>
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</table>

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

<table>
<thead>
<tr>
<th>P/N</th>
<th>Pack. unit [pcs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>400104758</td>
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</tr>
<tr>
<td>400104759</td>
<td>25</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</th>
<th>ØB / A [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>400056206</td>
<td>Z-RFC-S01</td>
<td>6 / 4.5</td>
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<tr>
<td>400056207</td>
<td>Z-RFC-S02</td>
<td>8 / 6.5</td>
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<tr>
<td>400056208</td>
<td>Z-RFC-S03</td>
<td>10 / 8.5</td>
</tr>
</tbody>
</table>
Position Markers

Working Distances Position Markers [mm] - Single-channel Versions
Z-RFC-P02 / P04 / P08
Z-RFC-P20 / P23 / P31
0 ... 1.4

Lateral Magnet Offset

Lateral magnet offset will cause additional linearity error. The angle error, which is caused by radial displacement of sensor and position marker depends on the used position marker or magnet.

Additional Linearity Error at Radial Displacement - Single-channel Versions
Z-RFC-P02 / P04 / P08
Z-RFC-P20 / P23 / P31
0.5 mm: ±0.4°
1.0 mm: ±0.7°
2.0 mm: ±2.2°
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

<table>
<thead>
<tr>
<th>P/N</th>
<th>Type</th>
<th>Length</th>
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<tr>
<td>400056135</td>
<td>EEM-33-35</td>
<td>2 m</td>
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<tr>
<td>400056136</td>
<td>EEM-33-36</td>
<td>5 m</td>
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<tr>
<td>400056137</td>
<td>EEM-33-37</td>
<td>10 m</td>
</tr>
</tbody>
</table>

IP67 Protection class IP67 DIN EN 60529
IP68 Protection class IP68 DIN EN 60529
Very good Electromagnetic Compatibility (EMC) and shield systems
Very good resistance to oils, coolants and lubricants
Suited for applications in drag chains
UL - approved
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
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.