NOVOHALL
Rotary Sensor
Touchless
RFC-4800
Ratiometric
Industrial

Special Features
• Touchless hall technology
• Electrical range up to 360°
• 2 part design, mechanically decoupled
• High protection class IP67, IP68, IP69
• Resolution 12 bit
• Wear-free
• Temperature range -40 °C to +105 °C
• Optimized for use in industrial applications
• Other configurations see separate data sheets

Applications
• Manufacturing Engineering (textile machinery, packaging machinery, sheet metal and wire machinery)
• Automation technology
• Medical Engineering

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.

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Housing: high grade, temperature resistant plastic</td>
</tr>
<tr>
<td>Mounting</td>
<td>With 2 pan head screws M4x20 (included in delivery)</td>
</tr>
<tr>
<td>Fastening torque of mounting</td>
<td>250 Nm</td>
</tr>
<tr>
<td>Electrical connection</td>
<td>Cable 4x 0.5 mm² (AWG 20), TPE, shielded / Connector M12x1, A-coded with cable L = 0.15 m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>See dimension drawing</td>
</tr>
<tr>
<td>Mechanical travel</td>
<td>continuous</td>
</tr>
<tr>
<td>Weight (w/o connection)</td>
<td>approx. 50 g</td>
</tr>
</tbody>
</table>
### Ordering Specifications

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

<table>
<thead>
<tr>
<th>R</th>
<th>F</th>
<th>C</th>
<th>4</th>
<th>8</th>
<th>5</th>
<th>1</th>
<th>6</th>
<th>3</th>
<th>6</th>
<th>2</th>
<th>1</th>
<th>1</th>
<th>2</th>
<th>0</th>
<th>2</th>
</tr>
</thead>
</table>

**Supply voltage Uk**
2: $U_k = 5$ VDC

**Output signal**
1: 5 ... 95% ratiometric to supply voltage $U_b$ (0.25 ... 4.75 VDC)
2: 10 ... 90% ratiometric to supply voltage $U_b$ (0.5 ... 4.5 VDC)

**Output characteristic**
1: Rising characteristic cw
2: Rising characteristic ccw
3: Crossed outputs, channel 1 rising cw (partly redundant)
Other output characteristics on request

**Electrical connection**
- 201: Cable, 4-pole, shielded, $L = 0.5$ m
- 202: Cable, 4-pole, shielded, $L = 1$ m
- 206: Cable, 4-pole, shielded, $L = 3$ m
- 210: Cable, 4-pole, shielded, $L = 5$ m
- 220: Cable, 4-pole, shielded, $L = 10$ m
- 501: Connector M12x1, 4-pin, with cable, shielded, $L = 0.15$ m
Cable versions and assembled connectors on request

**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: Single-channel version (1x supply voltage $U_b$, 1x output)
- 7: Partly redundant version (1x supply voltage $U_b$, 2x output)

### Accessories included in delivery
- 2x Pan head screws M4x20
When the marking of the position marker is pointing towards the cable, the sensor output is near the electrical center position.
Technical Data

**Type**

RFC-48-...-2-...

**Ratiometric**

**Output signal**

Ratiometric to supply voltage $U_b$

- 5 ... 95% (0.25 ... 4.75 V)
- 10 ... 90% (0.5 ... 4.5 V)

**Load**

$\geq 5 \, \Omega$

**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**

$\leq 0.5 \% $FS

**Resolution**

12 bits

**Repeatability**

typ. $\leq 0.1^\circ$

**Hysteresis**

typ. $< 0.1^\circ$

Only measuring range 360°: typ. $< 0.25^\circ$ (lower hysteresis on request)

**Temperature error**

Measuring range 30 ... 170°: typ. $\leq 0.7 \% $FS, Measuring range 0 ... 180°: typ. $\leq 0.35 \% $FS

**Supply voltage $U_b$**

5 VDC (4.5 ... 5.5 VDC)

**Current consumption w/o load**

typ. 12 mA per channel

**Polarity protection**

yes (supply lines and outputs)

**Short circuit protection**

yes (vs. GND and supply voltage)

**Insulation resistance (500 VDC)**

$\geq 10 \, M\Omega$

**Environmental Data**

**Max. operational speed**

Mechanically unlimited

**Vibration IEC 60068-2-6**

20 g, 150 Hz, $A_{max} = 0.75 \, mm$

**Shock IEC 60068-2-27**

50 g, 6 ms

**Protection class DIN EN 60529**

IP67 / IP68 / IP69, IP67 (connector M12)

**Operating temperature**

-40 ... +105°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)**

1652 years (one-channel) or 824 years (partly redundant, per channel)

**Conformity/Approval**


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

**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

**Traceability**

Serial number on type labeling, production batch of the sensor assembly and relevant sensor components

**Functional safety**

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

**MTTF (IEC 60050)**

1652 years (one-channel) or 824 years (partly redundant, per channel)

**Conformity/Approval**


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

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

**Connection Assignment**

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code 2...</th>
<th>Connector code 5...</th>
<th>Cable code 2...</th>
<th>Connector code 5...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage $U_b$</td>
<td>GN</td>
<td>Pin 1</td>
<td>GN</td>
<td>Pin 1</td>
</tr>
<tr>
<td></td>
<td>BN</td>
<td>Pin 3</td>
<td>BN</td>
<td>Pin 3</td>
</tr>
<tr>
<td>Signal output 1</td>
<td>WH</td>
<td>Pin 2</td>
<td>WH</td>
<td>Pin 2</td>
</tr>
<tr>
<td>Signal output 2</td>
<td>YE</td>
<td>Pin 4</td>
<td>YE</td>
<td>Pin 4</td>
</tr>
<tr>
<td>Not assigned</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Connect cable shielding to GND
Position Markers

<table>
<thead>
<tr>
<th>Position Marker</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>400005661</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>400056080</td>
<td>25</td>
</tr>
<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>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>400056084</td>
<td>25</td>
</tr>
<tr>
<td>Z-RFC-P41</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>400105037</td>
<td>1</td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>400105038</td>
<td>25</td>
</tr>
<tr>
<td>Z-RFC-P47</td>
<td>Position marker for frontal fixation with 2 cylinder head screws M4x20 (with screw lock) or with threaded pin M5 (both included in delivery).</td>
<td>PF</td>
<td>± 3 mm</td>
<td>-40 ... +125°C</td>
<td>400105039</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>400105040</td>
<td>25</td>
</tr>
</tbody>
</table>
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: 400104758 1
- Pack. unit [pcs]: 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: 400005658 1
- Pack. unit [pcs]: 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: 400005659 1
- Pack. unit [pcs]: 50

**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
- P/N: 400056206 Z-RFC-S01 6 / 4.5
- 400056207 Z-RFC-S02 8 / 6.5
- 400056208 Z-RFC-S03 10 / 8.5
Position Markers

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

<table>
<thead>
<tr>
<th>RFC-4851</th>
<th>RFC-4852</th>
<th>Z-RFC-P02 / P04 / P08</th>
<th>Z-RFC-P03 / P30</th>
<th>Z-RFC-P18 / P28</th>
<th>Z-RFC-P19</th>
<th>Z-RFC-P22</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3 ... 5</td>
<td>2.3 ... 5</td>
<td>0 ... 2.7</td>
<td>0.7 ... 2.2</td>
<td>0 ... 4.5</td>
<td>0 ... 2.2</td>
<td>4.4 ... 9.2</td>
</tr>
</tbody>
</table>

with diagnosis

<table>
<thead>
<tr>
<th>RFC-4853</th>
<th>RFC-4854</th>
<th>Z-RFC-P02 / P04 / P08</th>
<th>Z-RFC-P03 / P30</th>
<th>Z-RFC-P18 / P28</th>
<th>Z-RFC-P19</th>
<th>Z-RFC-P22</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 ... 4</td>
<td>0 ... 4</td>
<td>0 ... 2.7</td>
<td>0 ... 1.5</td>
<td>0 ... 4.5</td>
<td>0 ... 2.2</td>
<td>4.4 ... 9.2</td>
</tr>
</tbody>
</table>

w/o diagnosis

Working Distances Position Markers [mm] - Redundant Versions

<table>
<thead>
<tr>
<th>RFC-4851</th>
<th>RFC-4852</th>
<th>Z-RFC-P02 / P04 / P08</th>
<th>Z-RFC-P03 / P30</th>
<th>Z-RFC-P18 / P28</th>
<th>Z-RFC-P19</th>
<th>Z-RFC-P22</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.9 ... 4.5</td>
<td>1.9 ... 4.5</td>
<td>0 ... 2.3</td>
<td>0.3 ... 1.8</td>
<td>0 ... 4</td>
<td>0 ... 1.7</td>
<td>4 ... 8.8</td>
</tr>
</tbody>
</table>

with diagnosis

<table>
<thead>
<tr>
<th>RFC-4853</th>
<th>RFC-4854</th>
<th>Z-RFC-P02 / P04 / P08</th>
<th>Z-RFC-P03 / P30</th>
<th>Z-RFC-P18 / P28</th>
<th>Z-RFC-P19</th>
<th>Z-RFC-P22</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 ... 4</td>
<td>0 ... 4</td>
<td>0 ... 2.3</td>
<td>0 ... 1.5</td>
<td>0 ... 4</td>
<td>0 ... 1.7</td>
<td>4 ... 8.8</td>
</tr>
</tbody>
</table>

w/o diagnosis

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>Z-RFC-P02 / P04 / P08</th>
<th>Z-RFC-P03 / P30</th>
<th>Z-RFC-P18 / P28</th>
<th>Z-RFC-P19</th>
<th>Z-RFC-P22</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 mm: ±0.4°</td>
<td>0.5 mm: ±0.4°</td>
<td>0.5 mm: ±0.7°</td>
<td>0.5 mm: ±1.3°</td>
<td>1.0 mm: ±0.8°</td>
</tr>
<tr>
<td>1.0 mm: ±1.1°</td>
<td>1.0 mm: ±1.1°</td>
<td>1.0 mm: ±1.3°</td>
<td>1.0 mm: ±2.6°</td>
<td>2.0 mm: ±1.8°</td>
</tr>
<tr>
<td>2.0 mm: ±3.5°</td>
<td>2.0 mm: ±3.5°</td>
<td>2.0 mm: ±3.3°</td>
<td>2.0 mm: ±6.7°</td>
<td>4.0 mm: ±5.4°</td>
</tr>
</tbody>
</table>

Additional Linearity Error at Radial Displacement - Redundant Versions

<table>
<thead>
<tr>
<th>Z-RFC-P02 / P04 / P08</th>
<th>Z-RFC-P03 / P30</th>
<th>Z-RFC-P18 / P28</th>
<th>Z-RFC-P19</th>
<th>Z-RFC-P22</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 mm: ±0.7°</td>
<td>0.5 mm: ±0.7°</td>
<td>0.5 mm: ±1.1°</td>
<td>0.5 mm: ±2.3°</td>
<td>1.0 mm: ±1.1°</td>
</tr>
<tr>
<td>1.0 mm: ±1.8°</td>
<td>1.0 mm: ±1.8°</td>
<td>1.0 mm: ±2.2°</td>
<td>1.0 mm: ±4.5°</td>
<td>2.0 mm: ±2.4°</td>
</tr>
<tr>
<td>2.0 mm: ±5.2°</td>
<td>2.0 mm: ±5.2°</td>
<td>2.0 mm: ±4.6°</td>
<td>2.0 mm: ±6.7°</td>
<td>4.0 mm: ±6.7°</td>
</tr>
</tbody>
</table>
Connector System
M12

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

<table>
<thead>
<tr>
<th>P/N</th>
<th>Type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>400005600</td>
<td>EEM-33-32</td>
<td>2 m</td>
</tr>
<tr>
<td>400005609</td>
<td>EEM-33-62</td>
<td>5 m</td>
</tr>
<tr>
<td>400005650</td>
<td>EEM-33-97</td>
<td>10 m</td>
</tr>
</tbody>
</table>

Protection class IP67 DIN EN 60529
Very good Electromagnetic Compatibility (EMC) and shield systems
Very good resistance to oils, coolants and lubricants
Suitable for applications in dragchains
UL - approved
CAN-Bus
MAP-4000
Multifunctional measuring device with digital display for direct connection of potentiometric and normalized signals.
• Supply voltage 10...30 VDC, 80...250 VDC or AC
• High accuracy up to 0.1%
• Adjustable supply voltage for sensors 5...24 V
• Temperature coefficient 100 ppm/K
• Optional RS 232, RS 485, analog output, limited switch
• Complete data see separate data sheet
Connecting Options on request

**M12 connector**
- Customized lengths
- 3-, 4-, 6- and 6-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.