NOVOHALL
Rotary Sensor
touchless technology

Series RFC-4800

Special features
• Touchless hall technology
• Electrical range up to 360°
• 2-part, mechanically decoupled
• High protection class, IP67, IP69
• Resolution up to 14 bit
• Wear-free
• Temperature range -40 °C to +125 °C
• Single and multi-channel versions
• Optimized for use in industrial and mobile applications with highest EMC requirements such as ISO pulses and high interferences to ISO 11452 and ECE-Standard
• Suitable for safety-relevant applications according to DIN EN ISO 13849
• Interfaces:
  Voltage, current, SSI, incremental, CANopen, SPI, IO-Link
• Customized versions

Applications
• Manufacturing Engineering
  Textile machinery
  Packaging machinery
  Sheet metal and wire machinery
• Automation technology
• Medical engineering
• Mobile working machines
  Industrial trucks
  Construction machinery
  Agricultural and forestry machinery
• Marine applications

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.
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</tbody>
</table>
CAD data see www.novotechnik.de/en/download/cad-data/
Mechanical Data

Description

Housing: high grade, temperature resistant plastic

Electrical connection:
- Cable 4 x 0.5 mm², AWG 20, TPE, shielded (analog voltage / current CE, CANopen)
- Cable 4 x 0.5 mm², AWG 20, TPE, unshielded (analog voltage / current mobil)
- Cable 5 x 0.14 mm², AWG 26, PUR, shielded (SPI)
- Cable 8 x 0.25 mm², AWG 24, TPE, shielded (SSI, Incremental, CANopen IN/OUT)
- Wire 0.5 mm², AWG 20, PVC (analog voltage / current mobil, Incremental Open Collector)
- Connector M12x1, 4-pin / 5-pin / 8-pin with cable L=0.15 m
- Connector AMP-Superseal, 4-pin with cable L = 0.15 m

Mechanical Data

Dimensions: see dimension drawing

Mounting: with 2 lens flange head screws M4 (enclosed in delivery)

Fastening torque of mounting screws: 250 Ncm

Mechanical travel: 360 continuous °

Maximum operational speed: mechanically unlimited

Weight (without connection): approx. 50 g

Vibration (IEC 60068-2-6)
- 5 ... 200 Hz
- Amax = 0.75 mm
- amax = 20 g

Shock (IEC 60068-2-27)
- 50 (6 ms) g

Life: mechanically unlimited

Protection class DIN EN 60529
- IP67 / IP68 / IP69 (with M12 connector: IP67)

Temperature diagram
One-channel, cw

Two channels, crossed output characteristics, channels 1 cw

On request: Two channels, signal 2 = 0.5 x signal 1

On request: Different gradients

On request: Trapezoid output characteristic

On request: Parabola output characteristic

On request: 2 offset output characteristics
## Technical Data - Versions for Industrial Applications

Design optimized for use in machine and plant engineering. High reliability, simple interface to PLC, high variety.

### Type Designations

<table>
<thead>
<tr>
<th>Type Designations</th>
<th>RFC-48-...-2*-...</th>
<th>RFC-48-...-11*-...</th>
<th>RFC-48-...-12*-...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ratiometric</td>
<td></td>
<td>voltage</td>
<td>current</td>
</tr>
</tbody>
</table>

### Electrical Data

- **Output signal**
  - Ratiometric to supply voltage
    - 0.25 ... 4.75 V (5 ... 95 %)
    - 0.5 ... 4.5 V (10 ... 90 %)
  - (load >10 kΩ)
- **Number of channels**
  - 1 / 2
- **Diagnosis**
  - activated (in case of error output signal is outside of the plausible signal range)
- **Update rate**
  - typical 3.4 kHz
- **Resolution**
  - bit
- **Measuring range**
  - 0 ... 30 up to 0 ... 360, in 10°-steps
- **Independent linearity**
  - ≤ 0.5 % FS
- **Repeatability**
  - typical ±0.1 %
- **Hysteresis at measuring range < 360°**
  - typical ±0.25 %
  - (lower hysteresis on request)
- **Temperature error at measuring range 30 up to 170°**
  - typical ±0.7 %
  - typical ±1.0 %
  - typical ±1.2 % FS
- **Temperature error at measuring range 180 up to 360°**
  - typical ±0.35 %
  - typical ±0.5 %
  - typical ±0.6 % FS
- **Supply voltage Ub**
  - 5 V (4.5 ... 5.5 VDC)
  - 24 V (18 ... 30 VDC)
  - 24 V (13 ... 30 VDC)
- **Current consumption (w/o load)**
  - typical 12 per channel mA
- **Reverse voltage**
  - yes, supply lines and outputs
- **Short circuit protection**
  - yes (vs. GND and supply voltage)
- **Insulation resistance (500 VDC)**
  - ≥ 10 MΩ
- **Cross-section cable**
  - 0.5 (AWG 20) mm²

### Environmental Data

- **Operating temperature**
  - -40 ... +125 °C
  - -25 ... +85 with M12 connector
- **MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc)**
  - 99 (per channel) years
- **Functional safety**
  - If you need assistance in using our products in safety-related systems, please contact us
- **EMC compatibility**
  - EN 61000-4-2 Electrostatic discharge (ESD) 4 kV, 8 kV
  - EN 61000-4-3 Electromagnetic fields 10 V/m
  - EN 61000-4-4 Electrical fast transients (burst) 1 kV
  - EN 61000-4-6 Conducted disturbances, induced by RF-fields 10 V eff.
  - EN 55016-2-3 Radiated disturbances

### Connection assignment

#### One-channel versions

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code 2</th>
<th>Connector M12 code 501</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Ub</td>
<td>GN</td>
<td>pin 1</td>
</tr>
<tr>
<td>Signal output</td>
<td>WH</td>
<td>pin 2</td>
</tr>
<tr>
<td>GND</td>
<td>BN</td>
<td>pin 3</td>
</tr>
<tr>
<td>Not assigned</td>
<td>YE</td>
<td>pin 4</td>
</tr>
</tbody>
</table>

Cable shielding connect to GND.

#### Redundant versions

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code 2</th>
<th>Connector M12 code 501</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Ub</td>
<td>GN</td>
<td>pin 1</td>
</tr>
<tr>
<td>Signal output 1</td>
<td>WH</td>
<td>pin 2</td>
</tr>
<tr>
<td>Signal output 2</td>
<td>YE</td>
<td>pin 4</td>
</tr>
</tbody>
</table>

Cable shielding connect to GND.

When the marking of the position marker is pointing towards the cable, the sensor output is near the electrical center position.
### Ordering Specifications

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

#### Supply voltage Ub

<table>
<thead>
<tr>
<th>1: 24 V</th>
<th>2: 5 V</th>
</tr>
</thead>
</table>

#### Output signal supply voltage Ub = 24 V

| 1: 0.1 ... 10 V (only one-channel) | 2: 4 ... 20 mA (only one-channel) |

#### Output signal supply voltage Ub = 5 V

| 1: 0.25 ... 4.75 V ratiometric to supply voltage Ub (5 ... 95 %) | 2: 0.5 ... 4.5 V ratiometric to supply voltage Ub (10 ... 90 %) |

#### Output characteristics

- 1: Rising cw
- 2: Rising ccw
- 3: Crossed output channel 1 rising cw (partly redundant)

#### Other output characteristics on request

#### Electrical connections

- 201: Cable 4-pole, 0.5 m shielded
- 202: Cable 4-pole, 1 m shielded
- 206: Cable 4-pole, 3 m shielded
- 210: Cable 4-pole, 5 m shielded
- 220: Cable 4-pole, 10 m shielded
- 501: M12 connector 4-pin, with cable, L = 0.15 m, shielded

Cable versions and assembled connectors on request

#### Measuring range

<table>
<thead>
<tr>
<th>03: Angle 0° ... 30° min.</th>
<th>...</th>
</tr>
</thead>
<tbody>
<tr>
<td>06: Angle 0° ... 360° max.</td>
<td>Other angles on request</td>
</tr>
</tbody>
</table>

#### Number of channels

- 6: Single output 1 x supply voltage Ub / 1 x output
- 7: Partly redundant 1 x supply voltage Ub / 2 x output (only at supply voltage Ub = 5 V)

#### Series

Mechanical version
- 4851: Elongated hole mounting for easy adjustment
- 4862: Round hole mounting
- 4853: Elongated hole mounting, without diagnostic function
- 4864: Round hole mounting, without diagnostic function

Other versions f.e. with internal shielding against magnetic fields on request
Technical Data - Versions for Mobile Applications

These versions are optimized for the high requirements in mobile applications. Tested to the highest requirements as ISO-pulses and high interferences to ISO 11452.

### Type Designations

- RFC-48-2-
- RFC-48-3-
- RFC-48-32-

### Electrical Data

#### Output signal
- Ratiometric to supply voltage $U_b$
- $0.25 \ldots 4.75 \text{ V}$
- $0.5 \ldots 4.5 \text{ V}$
- Load $\geq 0.1 \Omega$
- 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
- Typical 3.4 kHz

#### Resolution
- 12 bit

#### Measuring range
- $0 \ldots 30$ up to $0 \ldots 360$, in $10^\circ$-steps

#### Independent linearity
- $0.5 \%$ FS

#### Repeatability
- Typical $0.1 \%$ FS

#### Hysteresis at measuring range $< 360^\circ$
- Typical $0.1 \%$ FS

#### Temperature error at measuring range $30$ and $170^\circ$
- Typical $0.7 \%$ FS

#### Temperature error at measuring range $180$ and $360^\circ$
- Typical $1.2 \%$ FS

#### Supply voltage $U_b$
- $5 \ [4.5 \ldots 5.5]$
- $12/24 \ [8 \ldots 34]$

#### Current consumption (w/o load)
- Typical 12 per channel mA

#### Reverse voltage
- Yes, supply lines and outputs

#### Short circuit protection
- Yes (vs. GND and supply voltage)

#### Insulation resistance (500 VDC)
- $> 10 \text{ M} \Omega$

#### Cross-section cable / lead wires
- $0.5 \ [AWG 20]$ mm²

#### Environmental Data

#### Operating temperature
- $-40 \ldots +25^\circ$ with M12 connector
- $-25 \ldots +85$ with M12 connector
- $-25 \ldots +85$ with M12 connector

#### Moisture resistance
- 10 MD

#### Connection assignment

### One-channel versions

<table>
<thead>
<tr>
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<th>Lead wires code</th>
<th>Cable code</th>
<th>Connector code 551 / 552</th>
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</thead>
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<tr>
<td>Supply voltage Ub</td>
<td>RD</td>
<td>GN</td>
<td>pin 1</td>
</tr>
<tr>
<td>Signal output</td>
<td>BU</td>
<td>WH</td>
<td>pin 2</td>
</tr>
<tr>
<td>GND</td>
<td>BK</td>
<td>EN</td>
<td>pin 3</td>
</tr>
<tr>
<td>Not assigned</td>
<td>YE</td>
<td></td>
<td>pin 4</td>
</tr>
</tbody>
</table>

### Redundant versions

<table>
<thead>
<tr>
<th>Signal</th>
<th>Lead wires code</th>
<th>Cable code</th>
<th>Connector code 551 / 552</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Ub 1</td>
<td>RD</td>
<td>GN</td>
<td>pin 1</td>
</tr>
<tr>
<td>Signal output 1</td>
<td>BU</td>
<td>WH</td>
<td>pin 2</td>
</tr>
<tr>
<td>GND 1</td>
<td>BK</td>
<td>EN</td>
<td>pin 3</td>
</tr>
<tr>
<td>Signal output 2</td>
<td>BU/WH</td>
<td>YE</td>
<td>pin 4</td>
</tr>
<tr>
<td>Supply voltage Ub 2</td>
<td>RD/WH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GND 2</td>
<td>BK/WH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When the marking of the position marker is pointing towards the cable, the sensor output is near the electrical center position.
Ordering specifications

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

Supply voltage
2: Supply voltage Ub = 5 V (4.5 ... 5.5 V)
3: Supply voltage Ub = 12/24 V (8 ... 34 V)

Output signal supply voltage Ub = 5 V
1: 0.25 ... 4.75 V ratiometric to supply voltage Ub (5 ... 95 %)
2: 0.5 ... 4.5 V ratiometric to supply voltage Ub (10 ... 90 %)

Output signal supply voltage Ub = 12/24 V
2: 4 ... 20 mA
4: 0.5 ... 4.5 V
5: 0.25 ... 4.75 V

Output characteristics
1: Rising cw
2: Rising ccw
3: Crossed output channel 1 rising cw (partly redundant)
4: Crossed output channel 1 rising cw (fully redundant)
Other output characteristics on request

Electrical connections
251: Cable 4-pole, 0.5 m unshielded, one-channel and partly redundant
252: Cable 4-pole, 1 m unshielded, one-channel and partly redundant
256: Cable 4-pole, 3 m unshielded, one-channel and partly redundant
270: Cable 4-pole, 5 m unshielded, one-channel and partly redundant
401: Lead wires 3 x L = 0.5 m, single
411: Lead wires 4 x L = 0.5 m, partly redundant
421: Lead wires 6 x L = 0.5 m, fully redundant
551: M12 connector 4-pin, with cable L = 0.15 m unshielded, one-channel and partly redundant
552: Connector AMP Superseal, 4-pin, with cable L = 0.15 m, unshielded, one-channel and partly redundant
Cable versions and assembled connectors on request

Measuring range
03: Angle 0° ... 30° min.
06, 12, 18, 24, 36
06: Angle 0° ... 360° max.
Other angles on request

Number of channels
6: one-channel 1x supply voltage Ub / 1 x output
7: partly redundant 1 x supply voltage Ub / 2 x output
8: fully redundant 2 x supply voltage Ub / 2 x output

Series
4851: Elongated hole mounting for easy adjustment
4852: Round hole mounting
4853: Elongated hole mounting, without diagnostic function
4854: Round hole mounting, without diagnostic function
Further versions f.e. with internal shielding against magnetic fields on request.
**Technical Data**

**SSI Interface**

**Electrical Data**

<table>
<thead>
<tr>
<th>Type Designations</th>
<th>RFC-48 ..-212-41 ..- ..-</th>
<th>Supply voltage 5 VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol</td>
<td>SSI 13 bit (12 bit data + 1 stop bit)</td>
<td></td>
</tr>
<tr>
<td>Inputs</td>
<td>RS422 compatible, CLK lines via optocoupler galvanically isolated</td>
<td></td>
</tr>
<tr>
<td>Monophasic time (µs)</td>
<td>16 µs</td>
<td></td>
</tr>
<tr>
<td>Coding</td>
<td>Gray</td>
<td></td>
</tr>
<tr>
<td>Update rate (internal)</td>
<td>2 000 kHz</td>
<td></td>
</tr>
<tr>
<td>Resolution across 360°</td>
<td>12 bit</td>
<td></td>
</tr>
<tr>
<td>Measuring range</td>
<td>360 °</td>
<td></td>
</tr>
<tr>
<td>Maximum operational speed (position marker)</td>
<td>30 000, higher speeds on request</td>
<td></td>
</tr>
<tr>
<td>Independent linearity</td>
<td>typical 0.5 ±% FS</td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>≤ 0.2 °</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>≤ 0.5, lower hysteresis on request</td>
<td></td>
</tr>
<tr>
<td>Temperature error</td>
<td>0.3 °</td>
<td></td>
</tr>
<tr>
<td>Supply voltage Ub</td>
<td>5 (4.5 ... 5.5), 24 (18 ... 30) VDC</td>
<td></td>
</tr>
<tr>
<td>Current consumption (w/o load)</td>
<td>typical 2 mA</td>
<td></td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>yes, supply lines</td>
<td></td>
</tr>
<tr>
<td>Short circuit protection</td>
<td>yes (output vs. supply voltage and GND)</td>
<td></td>
</tr>
<tr>
<td>Ohmic load at outputs</td>
<td>≤ 120 °</td>
<td></td>
</tr>
<tr>
<td>Max. clock rate</td>
<td>1 Mhz</td>
<td></td>
</tr>
<tr>
<td>Insulation resistance (500 VDC)</td>
<td>≥ 10 MΩ</td>
<td></td>
</tr>
<tr>
<td>Cross-section cable</td>
<td>0.25 (AWG 24) mm²</td>
<td></td>
</tr>
</tbody>
</table>

**Environmental Data**

- Operating temperature: -40 ... +85 (-25 ... +85 with M12 connector) °C
- MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc): 141 102 years
- Functional safety: If you need assistance in using our products in safety-related systems, please contact us.
- EMC compatibility:
  - EN 61000-4-2 Electrostatic discharge (ESD) 4 kV, 8 kV
  - EN 61000-4-3 Electromagnetic fields 10 V/m
  - EN 61000-4-4 Electrical fast transients (burst) 1 kV
  - EN 61000-4-6 Conducted disturbances, induced by RF fields 10 V eff.
  - EN 61000-4-8 Power frequency magnetic fields 30 A/m
  - EN 55016-2-3 Noise radiation class B

**Connection assignment**

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code 4 ..-</th>
<th>Connector M12 code 531</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Ub</td>
<td>WH</td>
<td>pin 1</td>
</tr>
<tr>
<td>GND</td>
<td>BN</td>
<td>pin 2</td>
</tr>
<tr>
<td>Clock input SSI Clk-</td>
<td>GN</td>
<td>pin 3</td>
</tr>
<tr>
<td>Clock input SSI Clk+</td>
<td>YE</td>
<td>pin 4</td>
</tr>
<tr>
<td>Signal output SSI Data-</td>
<td>GY</td>
<td>pin 5</td>
</tr>
<tr>
<td>Signal output SSI Data+</td>
<td>PK</td>
<td>pin 6</td>
</tr>
<tr>
<td>Not assigned</td>
<td>BU</td>
<td>pin 7</td>
</tr>
<tr>
<td>Not assigned</td>
<td>RD</td>
<td>pin 8</td>
</tr>
</tbody>
</table>

When the marking of the position marker is pointing towards the cable, the sensor output is near the electrical center position.
### Type Designations

<table>
<thead>
<tr>
<th>Model</th>
<th>Supply voltage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFC-48-2-5</td>
<td>5 VDC</td>
<td>Supply voltage 5 VDC</td>
</tr>
<tr>
<td>RFC-48-2-530-2</td>
<td>24 VDC, TTL</td>
<td>Supply voltage 24 VDC, TTL</td>
</tr>
<tr>
<td>RFC-48-2-534-2</td>
<td>24 VDC, HTL</td>
<td>Supply voltage 24 VDC, HTL</td>
</tr>
</tbody>
</table>

### Electrical Data

#### Outputs
- A+ / A-
- B+ / B-
- Z+ / Z-

- **Level:**
  - RS-422, TTL compatible
  - RS-422, TTL-compatible
  - HTL-compatible, Push-Pull

- **Supply voltage:**
  - 5 VDC
  - 24 VDC, TTL
  - 24 VDC, HTL

- **Length Z-pulse:**
  - 90 electrical, between 2 edges A / B

- **Pulses per revolution:**
  - 1024, other resolutions see page 12

- **Counts per revolution (after quadrature):**
  - 4096

#### Option Low Speed
- **Minimum edge separation:** 8 μs
- **Minimum input frequency of counter input:** 32 kHz
- **Maximum operational speed:** 1800 min⁻¹

#### Option High Speed
- **Minimum edge separation:** 0.5 μs
- **Minimum input frequency of counter input:** 500 kHz
- **Maximum operational speed:** 29,000, higher speeds on request

- **Measuring range:** 360°
- **Independent linearity:** typical 0.5
- **Repeatability:** ± 0.2° ±% FS
- **Hysteresis:** ± 0.7°, lower hysteresis on request
- **Temperature error:** 0.375 ±% FS
- **Supply voltage Ub:** 5 (4.5 ... 5.5) VDC
- **Current consumption (w/o load):**
  - typical 20 mA
  - typical 10 mA
- **Reverse voltage:** yes, supply lines
- **Short circuit protection:**
  - yes, all outputs vs. GND and supply voltage
  - yes, all outputs vs. GND and supply voltage
- **Chromatic load at output:**
  - ≥ 120 per channel A / B / Z
  - ≥ 120 per channel A / B / Z
  - ≥ 750 per channel A / B / Z

- **Insulation resistance (500 VDC):** 10 MΩ
- **Cross-section cable:** 0.25 (AWG 24)

#### Environmental Data

- **Operating temperature:**
  - -40 ... +85 (-25 ... +85 with M12 connector)
- **MTTF:** 183 122 122 years
- **Functional safety:**
  - If you need assistance in using our products in safety-related systems, please contact us
- **EMC compatibility:**
  - EN 61000-4-2 Electrostatic discharge (ESD) 4 kV, 8 kV
  - EN 61000-4-3 Electromagnetic fields 10 V/m
  - EN 61000-4-4 Electrical fast transients (burst) 1 kV
  - EN 61000-4-6 Conducted disturbances, induced by RF fields 10 V off.
  - EN 61000-4-8 Power frequency magnetic fields 30 A/m
  - EN 55016-2-3 Radiated disturbances

---

### Connection assignment

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code 4 _</th>
<th>Connector M12 code 531</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Ub</td>
<td>WH</td>
<td>pin 1</td>
</tr>
<tr>
<td>GND</td>
<td>BN</td>
<td>pin 2</td>
</tr>
<tr>
<td>A+</td>
<td>GN</td>
<td>pin 3</td>
</tr>
<tr>
<td>A-</td>
<td>YE</td>
<td>pin 4</td>
</tr>
<tr>
<td>B+</td>
<td>GY</td>
<td>pin 5</td>
</tr>
<tr>
<td>B-</td>
<td>PK</td>
<td>pin 6</td>
</tr>
<tr>
<td>Z+</td>
<td>BU</td>
<td>pin 7</td>
</tr>
<tr>
<td>Z-</td>
<td>RD</td>
<td>pin 8</td>
</tr>
</tbody>
</table>

*Note: When the marking of the position marker is pointing away from the cable, the output is in the vicinity of the reference pulse (Z). Rotational direction CW: A leads before B.*
Technical Data
Incremental Interface

Electrical Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Low Speed</th>
<th>High Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulses per revolution</td>
<td>1024</td>
<td>500</td>
</tr>
<tr>
<td>Counts per revolution (after quadrature)</td>
<td>4096</td>
<td>2048</td>
</tr>
<tr>
<td>Option Low Speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Minimal edge separation</td>
<td>1800</td>
<td>0,5</td>
</tr>
<tr>
<td>- Minimum input frequency of counter input</td>
<td>32</td>
<td>500</td>
</tr>
<tr>
<td>- Maximum operational speed</td>
<td>14400</td>
<td>105*</td>
</tr>
<tr>
<td>Option High Speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Minimal edge separation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Minimum input frequency of counter input</td>
<td>32*</td>
<td>500*</td>
</tr>
<tr>
<td>- Maximum operational speed</td>
<td></td>
<td>29000, higher speeds on request</td>
</tr>
</tbody>
</table>

*) The requirement for the minimum input frequency of counter input is reduced at lower speed (see below charts).
### Type Designations

<table>
<thead>
<tr>
<th>Type Designations</th>
<th>RFC-48_2_556_2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>12/24 VDC, open collector</td>
</tr>
</tbody>
</table>

### Electrical Data

<table>
<thead>
<tr>
<th>Outputs</th>
<th>A-</th>
<th>B-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Open collector</td>
<td></td>
</tr>
<tr>
<td>Pulses per revolution</td>
<td>1024</td>
<td>512</td>
</tr>
<tr>
<td>Counts per revolution (after quadrature)</td>
<td>4096</td>
<td>2048</td>
</tr>
<tr>
<td>Minimum edge separation</td>
<td>8</td>
<td>µs</td>
</tr>
<tr>
<td>Minimum input frequency of counter input</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Maximum operational speed</td>
<td>580</td>
<td>3900</td>
</tr>
<tr>
<td>Measuring range</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>Independent linearity</td>
<td>typical 0.5</td>
<td>±% FS</td>
</tr>
<tr>
<td>Repeatability</td>
<td>≤ 0.2</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>≤ 0.7, lower hysteresis on request</td>
<td></td>
</tr>
<tr>
<td>Temperature error</td>
<td>0.375</td>
<td>±% FS</td>
</tr>
<tr>
<td>Supply voltage Ub</td>
<td>12/24 VDC</td>
<td></td>
</tr>
<tr>
<td>Current consumption (w/o load)</td>
<td>typical 10 mA</td>
<td></td>
</tr>
<tr>
<td>Onvoltage protection</td>
<td>60 (temporary / 10 min.) VDC</td>
<td></td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>yes, supply lines</td>
<td></td>
</tr>
<tr>
<td>Short circuit protection</td>
<td>yes, all outputs vs. GND and supply voltage Ub</td>
<td></td>
</tr>
<tr>
<td>Load outputs vs. supply voltage Ub</td>
<td>20 per channel mA</td>
<td></td>
</tr>
<tr>
<td>Insulation resistance (500 VDC)</td>
<td>≥ 10 MΩ</td>
<td></td>
</tr>
<tr>
<td>Cross-section cable / lead wires</td>
<td>0.5 (AWG 20) mm²</td>
<td></td>
</tr>
<tr>
<td>Environment Data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-40 ... +85 (-25 ... +85 with M12 connector) °C</td>
<td></td>
</tr>
<tr>
<td>MTTF (DIN EN ISO 13849-1 parts count method, w/o load, w/o)</td>
<td>83 years</td>
<td></td>
</tr>
<tr>
<td>Functional safety</td>
<td>If you need assistance in using our products in safety-related systems, please contact us</td>
<td></td>
</tr>
<tr>
<td>EMC compatibility</td>
<td>ISO 11452-2 Radiated EMF fields, absorber half 100 V/m</td>
<td></td>
</tr>
<tr>
<td>ISO 7637-2 Pulses on supply lines (1) Level 3, (2a, 2b, 3a, 3b, 4, 5) Level 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CISPR 25 Radiated emission class 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The requirements for the minimum input frequencies of counter input is reduced at lower speed (see page 12).
Type Designations
RFC-48_2_8_
Supply voltage 5 VDC

Electrical Data

<table>
<thead>
<tr>
<th>Protocol</th>
<th>SPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coding</td>
<td>Binary code</td>
</tr>
<tr>
<td>Level SCLK, MOSI, /SS</td>
<td>TTL level (s. application note SPI protocol)</td>
</tr>
<tr>
<td>Update rate internal</td>
<td>14 kHz</td>
</tr>
<tr>
<td>Resolution across 360°</td>
<td>14 bit</td>
</tr>
<tr>
<td>Measuring range</td>
<td>360°</td>
</tr>
<tr>
<td>Independent linearity</td>
<td>&lt; 0.5 % FS</td>
</tr>
<tr>
<td>Repeatability</td>
<td>&lt; 0.1 % FS</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>&lt; 0.1 °</td>
</tr>
<tr>
<td>Temperature error</td>
<td>±0.625 °C</td>
</tr>
<tr>
<td>Supply voltage Ub</td>
<td>5 (4.5 ... 5.5) VDC</td>
</tr>
<tr>
<td>Current consumption (w/o load)</td>
<td>typical 15 mA</td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>yes, supply lines</td>
</tr>
<tr>
<td>Short circuit protection</td>
<td>yes (w.r.t. GND and supply voltage)</td>
</tr>
<tr>
<td>Max. clock rate</td>
<td>400 kHz</td>
</tr>
<tr>
<td>Insulation resistance (500 VDC)</td>
<td>≥ 10 MΩ</td>
</tr>
<tr>
<td>Cross-section cable</td>
<td>0.14 (AWG 26) mm²</td>
</tr>
</tbody>
</table>

Environmental Data

- Operating temperature: -40 ... +85 °C
- MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc): 272 years
- Functional safety
  - If you need assistance in using our products in safety-related systems, please contact us
- EMC compatibility
  - EN 61000-4-2 electrostatic discharge (ESD) 4 kV, 8 kV
  - EN 61000-4-3 electromagnetic fields 10 V/m
  - EN 61000-4-4 electrical fast transients (Burst) 1 kV
  - EN 61000-4-6 conducted disturbances, induced by RF fields 10 V eff.
  - EN 61000-4-8 Power frequency magnetic fields 30 A/m
  - EN 55011/EN 55022/A1 Radiated disturbances class B

SPI Interface

<table>
<thead>
<tr>
<th>SPI connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>angle sensor</td>
</tr>
<tr>
<td>/SS</td>
</tr>
<tr>
<td>SCLK</td>
</tr>
<tr>
<td>MOSI</td>
</tr>
<tr>
<td>MISO</td>
</tr>
<tr>
<td>GND (OV)</td>
</tr>
</tbody>
</table>

When the marking of the position marker is pointing towards the cable, the sensor output is near the electrical center position.

Connection assignment

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Ub</td>
<td>GIN</td>
</tr>
<tr>
<td>GND</td>
<td>B(N)</td>
</tr>
<tr>
<td>MOSI / MISO</td>
<td>YE(G)</td>
</tr>
<tr>
<td>SCLK</td>
<td>G(Y)</td>
</tr>
<tr>
<td>/SS (slave select)</td>
<td>WH</td>
</tr>
</tbody>
</table>
Ordering Specifications - Digital Versions
- SSI
- Incremental
- SPI

**Supply voltage Ub / Interface**

- 4: Synchronous-Serial Interface (SSI)
- 5: Incremental Interface A / B / Z
- 8: Serial Peripheral Interface (SPI)

**Interface parameters for SSI Interface**

- 11: 5 V (4.5 ... 5.5 V) Supply voltage, output RS422 comp., Gray code, rising cw
- 12: 5 V (4.5 ... 5.5 V) Supply voltage, output RS422 comp., Gray code rising ccw
- 41: 24 V (18 ... 30 V) Supply voltage, output RS422 comp., Gray code, rising cw
- 42: 24 V (18 ... 30 V) Supply voltage, output RS422 comp., Gray code rising ccw

**Interface parameters for Incremental Interface**

- Low Speed Mode (minimum edge separation 8 µs)
  - 15: 5 V (4.5 ... 5.5 V) supply voltage, output RS422, TTL-compatible
  - 35: 24 V (18 ... 30 V) supply voltage, output RS422, TTL-compatible
  - 39: 24 V (18 ... 30 V) supply voltage, output HTL-compatible, Push-Pull
  - 56: 12/24 V (9 ... 34 V) supply voltage, output low side, open collector

- High Speed Mode (minimal edge separation 0.5 µs)
  - 10: 5 V (4.5 ... 5.5 V) supply voltage, output RS422, TTL-compatible
  - 30: 24 V (18 ... 30 V) supply voltage, output RS422, TTL-compatible
  - 34: 24 V (18 ... 30 V) supply voltage, output HTL-compatible, Push-Pull
  - UVW signals instead of ABZ signals for motor commutation on request
  - Absolute position at Power On (Power on Burst) on request

**Interface parameters for SPI Interface**

- 31: 5 V (4.5 ... 5.5 V) Supply voltage, Binary code, rising cw

**Electrical connections**

- SSI / Incremental: 432: Cable 8-pole, 1.0 m, shielded
  - 436: Cable 8-pole, 3.0 m, shielded
  - 440: Cable 8-pole, 5.0 m, shielded
  - 450: Cable 8-pole, 10.0 m, shielded
- 531: Connector M12x1 8-pole with cable, L = 0.15 m, shielded
- Incremental Open Collector: 252: Cable 4-pole, 1.0 m, unshielded
  - 256: Cable 4-pole, 3.0 m, unshielded
  - 260: Cable 4-pole, 5.0 m, unshielded
  - 270: Cable 4-pole, 10.0 m, unshielded
- 411: Lead wires 4 x L = 0.5 m
- 551: Connector M12x1 4-pin with cable, L = 0.15 m, unshielded

**SPI**

- 302: Cable 5-pole 1.0 m, shielded

- Cable versions and assembled connectors on request

**Resolution**

- **SSI Interface**
  - 12: 12 bit
  - Other resolutions on request

- **Incremental Interface**
  - 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)

- **SPI Interface**
  - 14: 14 bit

**Mechanical version**

- 4801: Elongated hole
- 4802: Round hole mounting
### Technical Data

#### Type Designations
RF-C48 _ _- 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 see ordering specifications</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

**Diagnosis:**
- activated (in case of error output signal is outside of the plausible signal range)

**Node ID:**
- 1 ... 127 (default 127)

**Baud rate:**
- 50 ... 1000 see ordering specifications kBaud

**Resolution across 360° (position):**
- 360/2^14 = 0.022 °/ms

**Update rate:**
- 1 kHz

**Independent linearity:**
- ≤ 0.2 ±% FS

**Repeatability:**
- ≤ 0.36 °

**Hysteresis:**
- ≤ 0.36 °

**Temperature error:**
- ≤ 0.2 ±% FS

**Supply voltage Ub:**
- 12/24 (8 ... 34) VDC

**Current consumption (w/o load):**
- < 100 mA

**Reverse voltage:**
- yes, supply lines

**Short circuit protection:**
- yes, output vs. GND and supply voltage Ub (up to 40 VDC)

**Overvoltage protection:**
- ≤ 45 (permanent) VDC

**Insulation resistance (500 VDC):**
- ≥ 10 MΩ

**Cross-section cable:**
- 0.5 (AWG 20) (4-pole) resp. 0.25 (AWG 24) (8-pole) mm²

**Bus termination internal:**
- 120, optionally, see ordering specifications Ω

**MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc):**
- one-channel: 71 / two-channel: 58 years

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

**EMC compatibility:**
- ISO TR 10605:2005 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
- GSPR 25 Radiated emission class 3
- ISO 7637-2 Pulses on supply lines (1, 2a, 2b, 3a, 3b, 4 (24 V systems), 5) Level 5
- ISO 7637-3:2017 Transient emission Level 4

### Connection assignment

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable Code 2 _ _</th>
<th>Connector M12 Code 511</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN_SHLD</td>
<td>Shield</td>
<td>pin 1</td>
</tr>
<tr>
<td>Supply voltage Ub</td>
<td>WH</td>
<td>pin 2</td>
</tr>
<tr>
<td>GND</td>
<td>BN</td>
<td>pin 3</td>
</tr>
<tr>
<td>CAN_H</td>
<td>YE</td>
<td>pin 4</td>
</tr>
<tr>
<td>CAN_L</td>
<td>GN</td>
<td>pin 5</td>
</tr>
</tbody>
</table>

| Cable shielding connect to GND. |

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable Code 432</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN_SHLD</td>
<td>Shield</td>
</tr>
<tr>
<td>Supply voltage Ub</td>
<td>WH and RD</td>
</tr>
<tr>
<td>GND</td>
<td>BN and BU</td>
</tr>
<tr>
<td>CAN_H IN</td>
<td>YE</td>
</tr>
<tr>
<td>CAN_L IN</td>
<td>GN</td>
</tr>
<tr>
<td>CAN_H OUT</td>
<td>PK</td>
</tr>
<tr>
<td>CAN_L OUT</td>
<td>GY</td>
</tr>
</tbody>
</table>

When the marking of the position marker is pointing towards the cable, the sensor output is near the electrical center position.
**Type Designations**

- RFC-48 __ - 214 - A __ - __
  - IO-Link

**Electrical Data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured variables</td>
<td>Position (other process data such as speed, revolution counter or cams on request)</td>
</tr>
<tr>
<td>Measuring range</td>
<td>360</td>
</tr>
<tr>
<td>Number of channels</td>
<td>1</td>
</tr>
<tr>
<td>Output signal / protocol</td>
<td>IO-Link Spec V1.1 to IEC 61131-9, Smart Sensor Profile</td>
</tr>
<tr>
<td>Programmable parameter</td>
<td>Zero point offset, averaging, rotating direction</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>activated (in case of error output signal is outside of the plausible signal range)</td>
</tr>
<tr>
<td>Resolution across 360° (Position)</td>
<td>14 bit</td>
</tr>
<tr>
<td>Update rate</td>
<td>1 kHz</td>
</tr>
<tr>
<td>Transfer rate</td>
<td>COM 3 (230.4 kB)</td>
</tr>
<tr>
<td>Frame type</td>
<td>2.2</td>
</tr>
<tr>
<td>Minimum cycle time</td>
<td>1 ms</td>
</tr>
<tr>
<td>Independent linearity</td>
<td>0.5 %/FS</td>
</tr>
<tr>
<td>Repeatability</td>
<td>0.36 °</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>0.36 °</td>
</tr>
<tr>
<td>Temperature error</td>
<td>0.2 %/FS</td>
</tr>
<tr>
<td>Supply voltage Uib</td>
<td>24 V (18 ... 30) VDC</td>
</tr>
<tr>
<td>Current consumption (w/o load)</td>
<td>&lt; 100 mA</td>
</tr>
<tr>
<td>Reverse-voltage protection</td>
<td>yes, supply lines</td>
</tr>
<tr>
<td>Short circuit protection</td>
<td>yes, output vs. GND and Uib (up to 40 VDC)</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>&lt; 35 (permanent) VDC</td>
</tr>
<tr>
<td>Insulation resistance (500 VDC)</td>
<td>&gt; 10 MΩ</td>
</tr>
<tr>
<td>Cross-section cable</td>
<td>0.5 (AWG 20) mm²</td>
</tr>
</tbody>
</table>

**Environmental Data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation temperature</td>
<td>-40 ... +105 °C (25 ... +85 with M12 connector)</td>
</tr>
<tr>
<td>MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc)</td>
<td>single channel: 76 Jahre</td>
</tr>
<tr>
<td>Functional safety</td>
<td>If you need assistance in using our products in safety-related systems, please contact us</td>
</tr>
<tr>
<td>Electromagnetic compatibility</td>
<td>EN 61000-4-2 Electrostatic discharge (ESD) 4 kV, 8 kV</td>
</tr>
<tr>
<td></td>
<td>EN 61000-4-3 Electromagnetic fields 10 V/m</td>
</tr>
<tr>
<td></td>
<td>EN 61000-4-4 Electrical fast transients (burst) 2 kV</td>
</tr>
<tr>
<td></td>
<td>EN 61000-4-6 Conducted disturbances, induced by RF fields 10 V eff.</td>
</tr>
<tr>
<td></td>
<td>EN 55016-2-3 Radiated disturbances</td>
</tr>
</tbody>
</table>

**Connection assignment**

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code</th>
<th>Connector M12 code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Uib</td>
<td>BN</td>
<td>551</td>
</tr>
<tr>
<td>Do not connect*</td>
<td>GN</td>
<td>pin 2</td>
</tr>
<tr>
<td>GND</td>
<td>WH</td>
<td>pin 3</td>
</tr>
<tr>
<td>C/Q</td>
<td>YE</td>
<td>pin 4</td>
</tr>
</tbody>
</table>

* Alternatively on GND

When the marking of the position marker is pointing towards the cable, the sensor output is near the electrical center position.
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

- **Baud rate**
  1: Baud rate 1000 kBaund
  2: Baud rate 800 kBaund
  3: Baud rate 500 kBaund
  4: Baud rate 250 kBaund
  5: Baud rate 125 kBaund
  7: Baud rate 50 kBaund

#### Interface parameters CANopen

- 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

- 11: 1 x position, rising cw

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

### Series

#### Mechanical version

- 4851: Elongated hole
- 4852: Round hole mounting

### Electrical connections CANopen

- 202: Cable 4-pole 1.0 m, shielded
- 432: Cable 8-pole, 1.0 m shielded (CAN IN/OUT)
- 511: Connector M12x1, 5-pin, with cable, L= 0.15 m, shielded

### Electrical connections IO-Link

- 252: Cable 4-pole, 1.0 m, unshielded
- 256: Cable 4-pole, 3.0 m, unshielded
- 260: Cable 4-pole, 5.0 m, unshielded
- 270: Cable 4-pole, 10.0 m, unshielded
- 551: Connector M12x1, 4-pin, with cable, L= 0.15 m, unshielded

Cable versions and assembled connectors on request
Position Markers

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 400105039
  25 pcs. P/N 40005040

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 400056070
  25 pcs. P/N 400056084

Z-RFC-P41
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 400105037
  25 pcs. P/N 400105038

Z-RFC-P47
Position marker for fixation with threaded pin M5 (included in delivery).
• max. permitted radial offset ±3 mm
• packaging unit:
  1 pc. P/N 400105039
  25 pcs. P/N 40005040
Position Markers

Z-RFC-P18
Screw position marker
M10 x 25 mm, similar DIN 933, Aluminum anodized, magnet potted
  • max. permitted radial offset ±3 mm
  • packaging unit:
    1 pc. P/N 400104756
    25 pcs. P/N 400104757

Z-RFC-P19
Screw position marker
M8 x 25 mm, similar DIN 933 / ISO 4017
Aluminum anodized, magnet potted
  • max. permitted radial offset ±1.5 mm
  • packaging unit:
    1 pc. P/N 400104754
    25 pcs. P/N 400104755

Z-RFC-P20
Screw position marker
M10 x 25 mm, similar DIN 933, Aluminum anodized
  • max. permitted radial offset ±3 mm
  • packaging unit:
    1 pc. P/N 400104758
    25 pcs. P/N 400104759

Z-RFC-P43
Position marker for fixation with threaded pin M4
(included in delivery)
  • max. permitted radial offset ±3 mm
  • packaging unit:
    1 pc. P/N 400105041
    25 pcs. P/N 400105042
Z-RFC-P04
Magnet for direct application onto customer’s shaft
• max. permitted radial offset ±3 mm
• packaging unit:
  1 pc. P/N 400005659
  50 pcs. P/N 400056082

Z-RFC-P03
Magnet for direct application onto customer’s shaft
• max. permitted radial offset ±1.5 mm
• packaging unit:
  1 pc. P/N 400005658
  50 pcs. P/N 400056081

Z-RFC-P30
Position marker for frontal fixation with 2 fillister screws M3x8 (included in delivery)
• max. permitted radial offset ±1.5 mm
• packaging unit:
  1 pc. P/N 400056086
  25 pcs. P/N 400056087

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

### Working distances (mm)

<table>
<thead>
<tr>
<th>Interface</th>
<th>Z-RFC-P02 / P08</th>
<th>P03</th>
<th>P04</th>
<th>P18</th>
<th>P19</th>
<th>P20</th>
<th>P23</th>
<th>P30</th>
<th>P41 / P47</th>
<th>P 43</th>
</tr>
</thead>
<tbody>
<tr>
<td>One channel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFC-4853/4854: Analog * / SPI</td>
<td>0.4</td>
<td>0.7</td>
<td>1.1</td>
<td>1.3</td>
<td>1.5</td>
<td>1.7</td>
<td>1.9</td>
<td>2.1</td>
<td>2.3</td>
<td>2.5</td>
</tr>
<tr>
<td>RFC-4851/4852: Analog CANopen / IO-Link</td>
<td>0.4</td>
<td>0.7</td>
<td>1.1</td>
<td>1.3</td>
<td>1.5</td>
<td>1.7</td>
<td>1.9</td>
<td>2.1</td>
<td>2.3</td>
<td>2.5</td>
</tr>
</tbody>
</table>

| Partly / Fully redundant | | | | | | | | | | |
| RFC-4851/4852: Analog CANopen | 0.4 | 0.7 | 1.1 | 1.3 | 1.5 | 1.7 | 1.9 | 2.1 | 2.3 | 2.5 |

* without diagnostic function

### Mounting instructions Z-RFC-P03 / 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 approximately 20%
**Connector System M12**

M12x1 mating female connector, 4-pin, straight, A-coded, with molded cable, 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, -25 °C...+80 °C (moved) -50 °C...+80 °C (fixed)</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 33-32</td>
</tr>
<tr>
<td>5 m</td>
<td>EEM 33-62</td>
</tr>
<tr>
<td>10 m</td>
<td>EEM 33-97</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</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, 8-pin, straight, A-coded, with molded cable, 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. 8 mm, -25 °C...+80 °C (moved) -50 °C...+80 °C (fixed)</td>
</tr>
<tr>
<td>Wires</td>
<td>PP; 0.25 mm²</td>
</tr>
<tr>
<td>Length</td>
<td>Type</td>
</tr>
<tr>
<td>2 m</td>
<td>EEM 33-86</td>
</tr>
<tr>
<td>5 m</td>
<td>EEM 33-90</td>
</tr>
<tr>
<td>10 m</td>
<td>EEM 33-92</td>
</tr>
</tbody>
</table>
M12x1 mating female connector, 5-pin, straight, A-coded, with coupling nut, screw termination, IP67, shieldable, CAN bus

connector 

housing 

Metal 

-40 °C...+85 °C 

For wire gauge 
6...8 mm, max. 0.75 mm² 

Type EEM 33-73, P/N 400005645

It is possible to turn and fix the contact carrier in 90° positions.

M12x1 mating female connector, 5-pin, angled, A-coded, with coupling nut, screw termination, IP67, shieldable, CAN bus

connector 

housing 

Metal 

-40 °C...+85 °C 

For wire gauge 
6...8 mm, max. 0.75 mm² 

Type EEM 33-75, P/N 400005646

M12x1 splitter / T-connector, 5-pin, A-coded, IP68, 1:1 connection, female - male - female, CAN-Bus

connector 

housing 

PUR 

-25 °C...+85 °C 

Type EEM 33-45, P/N 400056145
M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-Bus

Connector housing: PUR

Operating temperature: -25 °C...+85 °C

Type: EEM 33-47, P/N 400056147

Pin assignment:
1 = n. c.
2 = n. c.
3 = n. c.
4 = Widerstand 120 Ω
5 = n. c.

M12x1 mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded, open ended, CAN-Bus

Connector housing: PUR

Cable sheath: PUR Ø = max. 7.2 mm,
-25 °C...+85 °C

Wires: PP 2x 0.25 mm²
+ 2 x 0.34 mm²

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 | Type | P/N
--- | --- | ---
2 m | EEM 33-41 | 400056141
5 m | EEM 33-42 | 400056142
10 m | EEM 33-43 | 400056143

M12x1 mating female connector, 5-pin, straight, A-coded, with molded cable, IP68, CAN-Bus

Connector housing: PUR

Cable sheath: PUR Ø 7.2 mm
-25 °C...+85 °C (fixed)

Length | Type | P/N
--- | --- | ---
5 m | EEM 33-44 | 400056144

Protection class: IP67 DIN EN 60529

Protection class: IP68 DIN EN 60529

CAN-bus

Very good Electromagnetic Compatibility (EMC) and shield systems

Very good resistance to oils, coolants und lubricants

UL - approved

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.
### Multifunctional Measuring Device with Display

**Series MAP4000**

- **Special features**
  - Supply voltage 10...30 VDC, 80...250 V DC or AC
  - High accuracy
  - Direct connection of potentiometric and standardized signals
  - 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 MAP-4000

### Ordering specifications

<table>
<thead>
<tr>
<th>MAP</th>
<th>4</th>
<th>0</th>
<th>1</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>1</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series</td>
<td>Supply voltage</td>
<td>Adjustable Excitation voltage (5...24 V/Max. 1.2 W)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00:</td>
<td>10...30 V AC/DC</td>
<td>1: Excitation present</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:</td>
<td>80...250 V AC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number comparator relays</th>
</tr>
</thead>
<tbody>
<tr>
<td>0: none</td>
</tr>
<tr>
<td>2: 2 relays</td>
</tr>
<tr>
<td>4: 4 relays</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analog output</th>
</tr>
</thead>
<tbody>
<tr>
<td>0: no analog output</td>
</tr>
<tr>
<td>1: analog output present</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>0: ni interface</td>
</tr>
<tr>
<td>1: RS 232</td>
</tr>
<tr>
<td>2: RS 485</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data storage (only with interface)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0: not storage</td>
</tr>
<tr>
<td>1: RTC storage</td>
</tr>
<tr>
<td>2: FAST storage</td>
</tr>
</tbody>
</table>

- M 010000104PA 1
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

Molex Mini Fit jr.
- Customized length and lead wires
- 3-, 4- and 6-pole versions
- on request

Tyco AMP Super Seal
- Pin- and bushing housing
- Customized lengths
- 3-, 4- and 6-pole versions
- Protection class IP67
- on request

Molex Mini Fit
- Customized length and lead wires
- 3-, 4-, 6- and 8-pole versions
- 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

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.