**NOVOHALL**

Rotary Sensor
touchless technology
transmissive

Series RFC-4800

---

**Special features**
- Touchless hall technology
- Electrical range up to 360°
- 2-part, mechanically decoupled
- High protection class, IP67, IP6K9K
- 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
- Interfaces:
  - Voltage, current, SSI, incremental, CANopen, SPI, IO-Link
- Customized versions

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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.

**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
<table>
<thead>
<tr>
<th>Contents</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Drawings</td>
<td>3</td>
</tr>
<tr>
<td>Mechanical Data</td>
<td>4</td>
</tr>
<tr>
<td>Output Characteristics</td>
<td>5</td>
</tr>
<tr>
<td><strong>Analog Versions for Industrial Applications</strong></td>
<td></td>
</tr>
<tr>
<td>Technical Data</td>
<td>6</td>
</tr>
<tr>
<td>Ordering Specifications</td>
<td>7</td>
</tr>
<tr>
<td><strong>Analog Versions for Mobile Applications</strong></td>
<td></td>
</tr>
<tr>
<td>Technical Data</td>
<td>8</td>
</tr>
<tr>
<td>Ordering Specifications</td>
<td>9</td>
</tr>
<tr>
<td><strong>Digital Versions</strong></td>
<td></td>
</tr>
<tr>
<td>SSI</td>
<td>10</td>
</tr>
<tr>
<td>Incremental for Industrial and Mobile Applications</td>
<td>11</td>
</tr>
<tr>
<td>SPI</td>
<td>14</td>
</tr>
<tr>
<td>Ordering Specifications</td>
<td>15</td>
</tr>
<tr>
<td><strong>Fieldbus Versions, IO-Link</strong></td>
<td></td>
</tr>
<tr>
<td>CANopen</td>
<td>16</td>
</tr>
<tr>
<td>IO-Link</td>
<td>17</td>
</tr>
<tr>
<td>Ordering Specifications</td>
<td>18</td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td></td>
</tr>
<tr>
<td>Position Markers</td>
<td>19</td>
</tr>
<tr>
<td>M12 Connector System</td>
<td>23</td>
</tr>
<tr>
<td>Signal processing</td>
<td>26</td>
</tr>
<tr>
<td><strong>Customized Versions</strong></td>
<td></td>
</tr>
<tr>
<td>Connecting Options</td>
<td>27</td>
</tr>
</tbody>
</table>
Pin assignment M12 connector

A-coded

Pin assignment M12 connector

A-coded

Pin assignment M12 connector

A-coded

CAD data see
www.novotechnik.de/en/
download/cad-data/
## Mechanical Data

### Description

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>high grade, temperature resistant plastic</td>
</tr>
</tbody>
</table>
| Electrical connection | - Cable 4x 0.14 mm², AWG 26, TPE, shielded (analog voltage / current CI)
                     |   - Cable 4x 0.14 mm², AWG 26, TPE, unshielded (analog voltage / current mobile)
                     |   - Cable 4x 0.5 mm², AWG 20, TPE, shielded (CANopen)
                     |   - Cable 5x 0.14 mm², AWG 26, PUR, shielded (SPI)
                     |   - Wire 0.5 mm², AWG 20, PVC, analog voltage / current mobile, Incremental Open Collector
                     |   - Connector M12x1, 4-pin / 5-pin / 8-pin with cable L=0.15 m       |

### Mechanical Data

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>see dimension drawing</td>
</tr>
<tr>
<td>Mounting</td>
<td>with 2 lens flange head screws M4 (enclosed in delivery)</td>
</tr>
<tr>
<td>Fastening torque of mounting screws</td>
<td>250 Ncm</td>
</tr>
<tr>
<td>Fastening torque of mounting screws</td>
<td>*</td>
</tr>
<tr>
<td>Mechanical travel</td>
<td>360 continuous</td>
</tr>
<tr>
<td>Maximum operational speed</td>
<td>mechanically unlimited</td>
</tr>
<tr>
<td>Weight (without connection)</td>
<td>approx. 50 g</td>
</tr>
<tr>
<td>Vibration (IEC 60068-2-6)</td>
<td>5 ... 2000 Hz</td>
</tr>
<tr>
<td>Amax = 0.75</td>
<td>mm</td>
</tr>
<tr>
<td>Amax = 20</td>
<td>g</td>
</tr>
<tr>
<td>Shock (IEC 60068-2-27)</td>
<td>50 (6 ms) g</td>
</tr>
<tr>
<td>Life</td>
<td>mechanically unlimited</td>
</tr>
<tr>
<td>Protection class (DIN EN 60529)</td>
<td>IP67 / IP68 / IP6K9K (M12 connector: IP67)</td>
</tr>
</tbody>
</table>
Output Characteristics

One-channel, cw

One-channel, ccw

Two channels, crossed output characteristics, channels 1 cw

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

On request: Trapezoid output characteristic

On request: Different gradients

On request: 2 offset output characteristics

On request: Parabolic output characteristic
### 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>RFC-4801- _ _ _ - 2 _ _ - _ _ _</th>
<th>RFC-4801- _ _ _ - 1 1 _ - _ _ _</th>
<th>RFC-4801- _ _ _ - 1 2 _ _ - _ _ _</th>
</tr>
</thead>
<tbody>
<tr>
<td>ratiometric</td>
<td>voltage</td>
<td>current</td>
</tr>
</tbody>
</table>

#### Electrical Data

**Voltage**: 0.1 ... 10 V (load ≥10 kΩ) 4 ... 20 mA (burden max. 500 Ω)

**Number of channels**: 1 / 2

**Update rate**: typical 5 kHz

**Resolution**: 12 bit

**Measuring range**: 0 ... 30 up to 0 ... 360, in 10°-steps

**Independent linearity**: ±0.5 ±% FS

**Repeatability**: ±0.1 ±% FS

**Hysteresis**: ±0.1 % FS

**Temperature error at measuring range 30 up to 170°**: ±0.825 ±% FS

**Temperature error at measuring range 180 up to 360°**: ±1.24 ±% FS

**Supply voltage Ub**: 5 (4.5 ... 5.5) 24 (18 ... 30) 24 (18 ... 30) VDC

**Current consumption (w/o load)**: typical 15 (typical 8 on request) 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**: AWG 26, 0.14 mm²

#### Environmental Data

**Operating temperature**: -40 ... +125 °C

**MTTF (DIN EN ISO 13849-1)**: 290 (one-channel) 288 (per channel, partly redundant) years

**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 3 A/m
EN 55011/EN 55022/A1 Radiated disturbances class B

### 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>GND</td>
<td>BN</td>
<td>pin 3</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 $U_b$

1: 24 V (18 ... 30 V)
2: 5 V (4.5 ... 5.5 V)

#### Output signal supply voltage $U_b = 24$ V

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

#### Output signal supply voltage $U_b = 5$ V

1: 0.25 ... 4.75 V ratiometric to supply voltage $U_b$
2: 0.5 ... 4.5 V ratiometric to supply voltage $U_b$

#### 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

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

#### Number of channels

6: Single output 1 x supply voltage $U_b$ / 1 x output
7: partly redundant 1 x supply voltage $U_b$ / 2 x output (only at supply voltage $U_b = 5$ V)

#### Series

4801: Elongated hole mounting for easy adjustment
4802: Round hole mounting
Technical Data - Analog Versions
- Voltage
- Current
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-4801- - - - -2 - - - -
RFV-4801- - - - -3 - - - -
RFC-4801- - - - -32 - - - -

Datalogic

Electrical Data

Type Designation

Supply voltage Ub
5 (4.5 ... 5.5) VDC
12/24 (9 ... 34) VDC
12/24 (9 ... 34) VDC

Current consumption (w/o load)
typical 8, (typical 15 on request) per channel

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
AWG 26, 0.14 mm²
AWG 20, 0.5 mm²

Environmental Data

Operating temperature
-40 ... +125 °C
-25 ... +85 °C with connector M12
-40 ... +105 °C (+125, if supply voltage < 28 V)

MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc)
290 (one-channel)
288 (per channel, partly redundant)
290 (per channel, fully redundant)

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

EMC compatibility
ISO 11452-2 Radiated EM RF fields 100 V/m
ISO 11452-2 BICO (Bulk current injection) 100 mA
CISPR25 Radiated emission class 5
SAE J1113-2 Conducted immunity level 2
SAE J1113-3 Packaging and handling 4-20 kV
SAE J1113-22 Radiated magnetic field 80 μT
SAE J1113-26 AC power line electric field 15 kV
EN61000-4-2 Immunity to static discharge (ESD)
4 kV, 8 kV, 15 kV
EN 55011/EN 55022/A1 Radiated disturbances class B

Connection assignment

One-channel versions

Signal | Lead wires code 4 | Cable code 2 | Connector M12 code 551
--- | --- | --- | ---
Supply voltage Ub | RD | GN | pin 1
Signal output | BU | WH | pin 2
GND | BK | BN | pin 3
Not assigned | - | YE | pin 4

Redundant versions

Signal | Lead wires code 4 | Cable code 2 | Connector M12 code 551
--- | --- | --- | ---
Supply voltage Ub 1 | RD | GN | pin 1
Supply voltage Ub 2 | RD | WH | pin 2
Signal output 1 | BU | WH | pin 2
Signal output 2 | BU/WH | YE | pin 4
Supply voltage Ub 2 | RD/WH | - | -
GND | BK | WH | -

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 $U_b = 5 \text{ V} \ (4.5 \ldots 5.5 \text{ V})$
- **3:** Supply voltage $U_b = 12/24 \text{ V} \ (9.0 \ldots 34.0 \text{ V})$

**Output signal (Supply voltage $U_b = 5 \text{ V}$)**

- **1:** $0.25 \ldots 4.75 \text{ V}$ ratiometric to supply voltage $U_b$
- **2:** $0.5 \ldots 4.5 \text{ V}$ ratiometric to supply voltage $U_b$

**Output signal (Supply voltage $U_b = 12/24 \text{ V}$)**

- **2:** $4 \ldots 20 \text{ mA}$ (only one-channel)
- **4:** $0.5 \ldots 4.5 \text{ V}$
- **5:** $0.25 \ldots 4.75 \text{ V}$

**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
- **260:** Cable 4-pole, 5 m unshielded, one-channel and partly redundant
- **270:** Cable 4-pole, 10 m unshielded, one-channel and partly redundant
- **401:** Lead wires 3 x $l = 0.5 \text{ m}$, single
- **411:** Lead wires 4 x $l = 0.5 \text{ m}$, partly redundant
- **421:** Lead wires 6 x $l = 0.5 \text{ m}$, fully redundant
- **551:** M12 connector 4-pin, with cable $l = 0.15 \text{ m}$ unshielded, one-channel and partly redundant

Cable versions and assembled connectors on request

**Measuring range**

- **03:** Angle $0^\circ \ldots 30^\circ$ min.
- **06, 12, 18, 24, 36**
- **36:** Angle $0^\circ \ldots 360^\circ$ max.

Other angles on request

**Number of channels**

- **6:** one-channel 1x supply voltage $U_b$ / 1 x output
- **7:** partly redundant 1 x supply voltage $U_b$ / 2 x output
- **8:** fully redundant 2 x supply voltage $U_b$ / 2 x output (only at supply voltage $U_b = 5 \text{ V}$)

**Series**

- **4801:** Elongated hole mounting for easy adjustment
- **4802:** Round hole mounting

**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 $U_b = 5 \text{ V} \ (4.5 \ldots 5.5 \text{ V})$
- **3:** Supply voltage $U_b = 12/24 \text{ V} \ (9.0 \ldots 34.0 \text{ V})$

**Output signal (Supply voltage $U_b = 5 \text{ V}$)**

- **1:** $0.25 \ldots 4.75 \text{ V}$ ratiometric to supply voltage $U_b$
- **2:** $0.5 \ldots 4.5 \text{ V}$ ratiometric to supply voltage $U_b$

**Output signal (Supply voltage $U_b = 12/24 \text{ V}$)**

- **2:** $4 \ldots 20 \text{ mA}$ (only one-channel)
- **4:** $0.5 \ldots 4.5 \text{ V}$
- **5:** $0.25 \ldots 4.75 \text{ V}$

**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
- **260:** Cable 4-pole, 5 m unshielded, one-channel and partly redundant
- **270:** Cable 4-pole, 10 m unshielded, one-channel and partly redundant
- **401:** Lead wires 3 x $l = 0.5 \text{ m}$, single
- **411:** Lead wires 4 x $l = 0.5 \text{ m}$, partly redundant
- **421:** Lead wires 6 x $l = 0.5 \text{ m}$, fully redundant
- **551:** M12 connector 4-pin, with cable $l = 0.15 \text{ m}$ unshielded, one-channel and partly redundant

Cable versions and assembled connectors on request

**Measuring range**

- **03:** Angle $0^\circ \ldots 30^\circ$ min.
- **06, 12, 18, 24, 36**
- **36:** Angle $0^\circ \ldots 360^\circ$ max.

Other angles on request

**Number of channels**

- **6:** one-channel 1x supply voltage $U_b$ / 1 x output
- **7:** partly redundant 1 x supply voltage $U_b$ / 2 x output
- **8:** fully redundant 2 x supply voltage $U_b$ / 2 x output (only at supply voltage $U_b = 5 \text{ V}$)

**Series**

- **4801:** Elongated hole mounting for easy adjustment
- **4802:** Round hole mounting
**Type Designations**

RFC-48-214-41 - Supply voltage 5 VDC

RFC-48-214-44 - Supply voltage 24 VDC

**Electrical Data**

- **Protocol**: SSI 13 bit (12 bit data + 1 stop bit)
- **Inputs**: RS422 compatible, CLK lines via optocoupler galvanically isolated
- **Monostable time (tM)**: 16 µs
- **Coding**: Gray
- **Update rate (internal)**: 2 kHz
- **Resolution across 360°**: 12 bit
- **Measuring range**: 360°
- **Maximum operational speed position marker**: 35,000, higher speeds on request
- **Independent linearity**: typical 0.5 ±% FS
- **Repeatability**: ± 0.2
- **Temperature error**: ± 0.75 °C, lower hysteresis on request
- **Supply voltage Ub**: 5 (4.5 ... 5.5) VDC
- **Current consumption (w/o load)**: typical 27 mA
- **Reverse voltage**: yes, supply lines
- **Short circuit protection**: yes (output vs. supply voltage and GND)
- **Ohmic load at outputs**: ≥ 120 Ω
- **Max. clock rate**: 1 MHz
- **Insulation resistance (500 VDC)**: ≥ 10 MΩ
- **Cross-section cable**: AWG 24, 0.25 mm²

**Environmental Data**

- **Operating temperature**: -40 ... +85 (-25 ... +85 with M12 connector) °C
- **MTTF (DIN EN ISO 13849-1)**: 141 102 years

**Technical Data**

**SSI Interface**

- **Connection assignment**
  - **Signal**: Supply voltage Ub, GND, Clock input SSI Clk-, Clock input SSI Clk+.
  - **Cable code**: 4 _ _, Connector M12 code 531
  - **Connector output SSI Data-**, **Connector output SSI Data+**, **Not assigned**, **Not assigned**

**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

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_2.hex-5
- RFC-48_2.hex-530
- RFC-48_2.hex-534

### Supply voltage
- RFC-48_2.hex-5 Supply voltage 5 VDC
- RFC-48_2.hex-530 Supply voltage 24 VDC, TTL
- RFC-48_2.hex-534 Supply voltage 24 VDC, HTL

## Electrical Data

<table>
<thead>
<tr>
<th>Outputs</th>
<th>A+ / A-</th>
<th>B+ / B-</th>
<th>Z+ / Z-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>RS-422, TTL-compatible</td>
<td>RS-422, TTL-compatible</td>
<td>HL-compatible, Push-Pull</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length Z-pulse</th>
<th>90 electrical, between 2 edges A / B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulses per revolution</td>
<td>1024, other resolutions see page 12</td>
</tr>
<tr>
<td>Counts per revolution (after quadrature)</td>
<td>4,096</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option Low Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Minimum edge separation</td>
</tr>
<tr>
<td>- Minimum input frequency of counter input</td>
</tr>
<tr>
<td>- Maximum operational speed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option High Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Minimum edge separation</td>
</tr>
<tr>
<td>- Maximum input frequency of counter input</td>
</tr>
<tr>
<td>- Maximum operational speed</td>
</tr>
</tbody>
</table>

- Measuring range: 360°
- Independent linearity: typical 0.5 ±% FS
- Repeatability: ±0.2°
- Hysteresis: ±0.7°, lower hysteresis on request
- Temperature error: 0.375 ±% FS

### Supply Voltage and Current Consumption
- Supply voltage Ub: 5 (4.5 ... 5.5) VDC
- Supply voltage Ub: 24 (18 ... 30) VDC
- Current consumption (w/o load): typical 20 mA
- Current consumption (w/o load): typical 10 mA
- Reverse voltage: yes, supply lines
- Ambient temperature: operating temperature: -40 ... +85°C (-25 ... +85°C with M12 connector), 183 years MTF, (DIN EN ISO 13849-1 parts count method, w/o load, ec)

## Electronic Data
- 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 Radiated disturbances

## Connection assignment

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code</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>

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>Pulses per revolution</th>
<th>1024</th>
<th>512</th>
<th>256</th>
<th>128</th>
<th>ppr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counts per revolution (after quadrature)</td>
<td>4096</td>
<td>2048</td>
<td>1024</td>
<td>512</td>
<td></td>
</tr>
</tbody>
</table>

**Option Low Speed**

- Minimal edge separation: 8 µs
- Minimum input frequency of counter input: 32 kHz
- Maximum operational speed: 1800, 3600, 7200, 14400 min⁻¹

**Option High Speed**

- Minimal edge separation: 0.5 µs
- Minimum input frequency of counter input: 500 kHz
- Maximum operational speed: 29000, higher speeds on request

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

---

**Incremental connection**

[Diagram of incremental connection showing A, B, Z signals and a customer application interface with inputs and outputs.]

---

**Pulse Rate Option Low Speed**

- Minimal edge separation
- Rotation speed vs. input frequency graph: 256 ppr to 128 ppr
- Rotation speed max: 8900 min⁻¹

**Pulse Rate Option High Speed**

- Minimal edge separation
- Rotation speed vs. input frequency graph: 256 ppr to 128 ppr
- Rotation speed max: 23400 min⁻¹

*) max: 120000 Units, tested by max. operational speed of position marker.
Type Designations

<table>
<thead>
<tr>
<th>RFC-48_2_556_</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage 12/24 VDC, open collector</td>
</tr>
</tbody>
</table>

Electrical Data

<table>
<thead>
<tr>
<th>Signal</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-</td>
<td>B-</td>
</tr>
</tbody>
</table>

Level: Open collector

- Poles per revolution: 1024, 512, 256, 128 (ppr)
- Counts per revolution (after quadrature): 4096, 2048, 1024, 512
- Minimum edge separation: 8 µs
- Minimum input frequency of counter input: 32, 32, 32 kHz
- Maximum operational speed: 580, 3900, 7200, 14400 min⁻¹
- Measuring range: 360°
- Independent linearity: typical 0.5 ± % FS
- Repeatability: < 0.2°
- Hysteresis: < 0.7°, lower hysteresis on request

- Temperature error: 0.375 ± % FS
- Supply voltage Ub: 12/24 V (9 ... 34 VDC)
- Current consumption (w/o load): typical 10 mA
- Overvoltage protection: 60 (temporary / 10 min.) VDC
- Reverse voltage: yes, supply lines
- Short circuit protection: yes, all outputs vs. GND and supply voltage Ub
- Load outputs vs. supply voltage Ub: 20 per channel mA
- Insulation resistance (500 VDC): > 10 MΩ
- Cross-section cable / lead wires: AWG 20, 0.5 mm²

Environmental Data

- Operating temperature: -40 ... +85°C
- MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc): 83 years

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

- EMC compatibility
  - ISO TR 10605 Packaging and Handling + Component Test 6 kV, 15 kV
  - ISO 11452-2 Radiated EMF fields, absorber half 100 V/m
  - ISO 11452-5 Radiated EMF fields, stripline 200 V/m
  - ISO 7637-2 Pulse 1 Level 3, 2a, 2b, 3a, 3b, 4, 5 Level 4
  - CISPR 25 Radiated emission class 5

*) The requirements for the minimum input frequencies of counter input is reduced at lower speed (see page 12).
## Technical Data

### SPI Interface

<table>
<thead>
<tr>
<th>SPI protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
</tr>
<tr>
<td>SCLK</td>
</tr>
<tr>
<td>MOSI</td>
</tr>
<tr>
<td>/SS</td>
</tr>
<tr>
<td>GND</td>
</tr>
</tbody>
</table>

### Connection assignment

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Uib</td>
<td>GN</td>
</tr>
<tr>
<td>GND</td>
<td>BN</td>
</tr>
<tr>
<td>MOSI/MISO</td>
<td>YE</td>
</tr>
<tr>
<td>SCLK</td>
<td>GY</td>
</tr>
<tr>
<td>/SS (slave select)</td>
<td>WH</td>
</tr>
</tbody>
</table>

### SPI connection

When the marking of the position marker is pointing towards the cable, the sensor output is near the electrical center position.
**Ordering Specifications - Digital Versions**

- **SSI**
- **Incremental**
- **SPI**

### Ordering specifications

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

### 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

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

### Resolution 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)
Other resolutions on request

### Resolution SPI Interface

14: 14 bit

---

**Series**

- **R**
- **F**
- **C**
- **4**
- **8**
- **0**
- **2**
- **1**
- **2**
- **4**
- **1**
- **4**
- **3**
- **2**

**Mechanical version**

- 4801: Elongated hole
- 4802: Round hole mounting
**Type Designations**

Type Designation: RFC-48 _ _- 214 - 6 _ _ - _ _ _

**CANopen**

**Electrical Data**

**Measured variables**
- Position and speed

**Measuring range**
- 360°

**Measurement range speed**
- 0 ... 1600 min⁻¹

**Number of channels**
- 1 / 2 see ordering specifications

**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

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

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

**Resolution across 360° (position)**
- 14 bit

**Resolution speed**
- 360/2¹⁴ ≈ 0,022 °/ms

**Update rate**
- 1 kHz

**Independent linearity**
- ± 0,5 ±% FS

**Repeatability**
- ± 0,36 °

**Hysteresis**
- ± 0,36 °

**Temperature error**
- ± 0,02 °

**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)

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

**Cross-section cable**
- AWG 20, 0.5 mm²

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

**Environmental Data**

**Operation temperature**
- -40 ... +105 (-25 ... +85 with M12 connector) °C

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

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

**EMC compatibility**
- ISO TR 10605 Packaging and Handling + Component Test 8 kV
- ISO 11452-2 Radiated EM RF fields, Absorberhall 100 V/m
- ISO 11452-3 Radiated EM RF fields, Stripline 200 V/m
- CISPR 25 Radiated emission class 3
- ISO 7637-2 Pulse 1, 2a, 2b, 3a, 3b, 4 (24 V systems), 5 Level 5
- ISO 7637-3 Transient transmission Level 4

---

**Connection assignment**

**Signal**

<table>
<thead>
<tr>
<th>Cable</th>
<th>Connector M12</th>
<th>Code 2</th>
<th>Code 511</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN_SHLD</td>
<td>Shield</td>
<td>pm 1</td>
<td></td>
</tr>
<tr>
<td>Supply voltage Ub</td>
<td>WH</td>
<td>pm 2</td>
<td></td>
</tr>
<tr>
<td>GND</td>
<td>BN</td>
<td>pm 3</td>
<td></td>
</tr>
<tr>
<td>CAN_H</td>
<td>YE</td>
<td>pm 4</td>
<td></td>
</tr>
<tr>
<td>CAN_L</td>
<td>GN</td>
<td>pm 5</td>
<td></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.
**Type Designations**

<table>
<thead>
<tr>
<th>Type Designations</th>
<th>IO-Link RFC-48_2_214-A__</th>
</tr>
</thead>
</table>

**Electrical Data**

<table>
<thead>
<tr>
<th>Measured variables</th>
<th>Position (other process data such as speed, revolution counter or cams on request)</th>
</tr>
</thead>
<tbody>
<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>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 Ub</td>
<td>24 (18 ... 30) VDC</td>
</tr>
<tr>
<td>Current consumption (w/o load)</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 Ub (up to 40 VDC)</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>&lt; 35 (permanent) VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>&gt; 10 MΩ</td>
</tr>
<tr>
<td>Cross-section cable</td>
<td>AWG 20, 0.5 (4 pole) or AWG 24, 0.25 (8 pole)</td>
</tr>
</tbody>
</table>

**Environmental Data**

<table>
<thead>
<tr>
<th>Operation temperature</th>
<th>-40 ... +105 ( -25 ... +85 with M12 connector) °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc)</td>
<td>single channel: 76 Jahre</td>
</tr>
</tbody>
</table>

**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) 2 kV
EN 61000-4-6 Conducted disturbances, induced by RF fields 10 V eff.
EN 55016-2-3 Radiated disturbances

**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 2__</th>
<th>Connector M12 code 551</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Ub</td>
<td>IN</td>
<td></td>
</tr>
<tr>
<td>Do not connect*</td>
<td>GN</td>
<td></td>
</tr>
<tr>
<td>GND</td>
<td>WH</td>
<td></td>
</tr>
<tr>
<td>C/Q</td>
<td>YE</td>
<td></td>
</tr>
</tbody>
</table>

*) Alternatively on GND
## 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>Interface</th>
<th>CANopen Interface</th>
<th>A: IO-Link</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interface parameters CANopen</strong></td>
<td>6:</td>
<td>1: 1 x position, 1 x speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2: 2 x position, 2 x speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5: 1 x position, 1 x speed with bus termination 120 Ω</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6: 2 x position, 2 x speed with bus termination 120 Ω</td>
</tr>
<tr>
<td><strong>Interface parameters IO-Link</strong></td>
<td>A:</td>
<td>11: 1 x position, rising cw</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other process data such as speed, revolution counter or cams on request</td>
</tr>
</tbody>
</table>

**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 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= 0.15m, 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= 0.15m, unshielded

Cable versions and assembled connectors on request

**Series**

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

**Mechanical version**
- 4851: Elongated hole
- 4852: Round hole mounting
Z-RFC-P01
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with microencapsulation) or with locking pin (both are included in delivery).

Not recommended for new designs.
• max. permitted radial offset ±1.5 mm
• packaging unit:
  1 pc. P/N 005660
  25 pcs. P/N 056079

Z-RFC-P02
Position marker for frontal fixation with 2 cylinder head screws M4x20 (with microencapsulation) or with locking pin (both are included in delivery).

• max. permitted radial offset ±3 mm
• packaging unit:
  1 pc. P/N 005661
  25 pcs. P/N 056080

Z-RFC-P07
Position marker for fixation with threaded pin M5 (included in delivery).

Not recommended for new designs.
• max. permitted radial offset ±1.5 mm
• packaging unit:
  1 pc. P/N 056069
  25 pcs. P/N 056083

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 056070
  25 pcs. P/N 056084
### Position Markers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Max. Permitted Radial Offset</th>
<th>Packaging Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-RFC-P20</td>
<td>Screw position marker M10 x 25 mm, similar DIN 933, Aluminum anodized</td>
<td>±3 mm</td>
<td>1 pc. P/N 104758, 25 pcs. P/N 104759</td>
</tr>
<tr>
<td>Z-RFC-P18</td>
<td>Screw position marker M10 x 25 mm, similar DIN 933, Aluminum anodized, magnet potted</td>
<td>±3 mm</td>
<td>1 pc. P/N 104756, 25 pcs. P/N 104757</td>
</tr>
<tr>
<td>Z-RFC-P19</td>
<td>Screw position marker M8 x 25 mm, similar DIN 933 / ISO 4017, Aluminum anodized, magnet potted</td>
<td>±1.5 mm</td>
<td>1 pc. P/N 104754, 25 pcs. P/N 104755</td>
</tr>
<tr>
<td>Z-RFC-P23</td>
<td>Position marker for fixation with threaded pin M4 (included in delivery)</td>
<td>±3 mm</td>
<td>1 pc. P/N 056074, 25 pcs. P/N 056085</td>
</tr>
</tbody>
</table>

![Position mark for fixation with threaded pin M4](image)

![Screw position marker M10 x 25 mm, similar DIN 933](image)

![Screw position marker M8 x 25 mm, similar DIN 933 / ISO 4017](image)

![Screw position marker M10 x 25 mm, similar DIN 933, Aluminum anodized](image)
Position Markers

**Z-RFC-P04**
Magnet for direct application onto customer's shaft
- max. permitted radial offset ±1.5 mm
- packaging unit:
  1 pc. P/N 005658
  50 pcs. P/N 056081

**Z-RFC-P03**
Magnet for direct application onto customer's shaft
- max. permitted radial offset ±1.5 mm
- packaging unit:
  1 pc. P/N 005659
  50 pcs. P/N 056082

**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 056086
  25 pcs. P/N 056087

**Shaft adapter for Z-RFC-P01 and Z-RFC-P02**
Fixation at position marker with locking pin
- Z-RFC-S01: Ø 6 mm, P/N 056206
- Z-RFC-S02: Ø 8 mm, P/N 056207
- Z-RFC-S03: Ø 10 mm, P/N 056208
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

<table>
<thead>
<tr>
<th>Interface</th>
<th>Z-RFC-P02 / P04 / P08 / P23</th>
<th>Z-RFC-P01 / P03 / P07 / P30</th>
<th>Z-RFC-P18</th>
<th>Z-RFC-P19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog / SPI single</td>
<td>0.4</td>
<td>1.1</td>
<td>0.7</td>
<td>1.3</td>
</tr>
<tr>
<td>Analog / CANopen redundant</td>
<td>0.4</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>SSI / Incremental</td>
<td>0.4</td>
<td>0.7</td>
<td>2.2</td>
<td>-</td>
</tr>
</tbody>
</table>
### M12x1 mating female connector, 4-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

**Connector housing**
- Plastic PA

**Cable sheath**
- PUR; Ø = max. 6 mm,
  - -25 °C...+80 °C (moved)
  - -50 °C...+80 °C (fixed)

<table>
<thead>
<tr>
<th>Length</th>
<th>Type</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 m</td>
<td>EEM 33-32</td>
<td>005600</td>
</tr>
<tr>
<td>5 m</td>
<td>EEM 33-62</td>
<td>005609</td>
</tr>
<tr>
<td>10 m</td>
<td>EEM 33-97</td>
<td>005650</td>
</tr>
</tbody>
</table>

**Wires**
- PP, 0.34 mm²

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

**Connector housing**
- Plastic PA

**Cable sheath**
- PUR; Ø = max. 6 mm,
  - -40 °C...+85 °C

<table>
<thead>
<tr>
<th>Length</th>
<th>Type</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 m</td>
<td>EEM 33-35</td>
<td>056135</td>
</tr>
<tr>
<td>5 m</td>
<td>EEM 33-36</td>
<td>056136</td>
</tr>
<tr>
<td>10 m</td>
<td>EEM 33-37</td>
<td>056137</td>
</tr>
</tbody>
</table>

**Wires**
- PP, 0.34 mm²

### M12x1 mating female connector, 8-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

**Connector housing**
- Plastic PA

**Cable sheath**
- PUR; Ø = max. 8 mm,
  - -25 °C...+80 °C (moved)
  - -50 °C...+80 °C (fixed)

<table>
<thead>
<tr>
<th>Length</th>
<th>Type</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 m</td>
<td>EEM 33-86</td>
<td>005629</td>
</tr>
<tr>
<td>5 m</td>
<td>EEM 33-90</td>
<td>005633</td>
</tr>
<tr>
<td>10 m</td>
<td>EEM 33-92</td>
<td>005637</td>
</tr>
</tbody>
</table>

**Wires**
- PP, 0.25 mm²

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

**Connector housing**
- Plastic PBT

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

Type EEM 33-88, P/N 005633
**Connector System M12**

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

<table>
<thead>
<tr>
<th>Connector housing</th>
<th>Metal</th>
<th>-40 °C...+85 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>For wire gauge</td>
<td>6...8 mm, max. 0.75 mm²</td>
<td></td>
</tr>
</tbody>
</table>

Type EEM 33-73, P/N 005645

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

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

<table>
<thead>
<tr>
<th>Connector housing</th>
<th>PUR</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-25 °C...+85 °C</td>
<td></td>
</tr>
</tbody>
</table>

Type EEM 33-45, P/N 006145
### M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-Bus Connector housing
- **Type:** PUR
- **Operating temperature:** -25 °C... +85 °C
- **Type:** EEM 33-47, P/N 056147

#### Pin assignment
- 1 = n. c.
- 2 = n. c.
- 3 = n. c.
- 4 = Widerstand 120 Ω

<table>
<thead>
<tr>
<th>Length</th>
<th>Type</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 m</td>
<td>EEM 33-41</td>
<td>056141</td>
</tr>
<tr>
<td>5 m</td>
<td>EEM 33-42</td>
<td>056142</td>
</tr>
<tr>
<td>10 m</td>
<td>EEM 33-43</td>
<td>056143</td>
</tr>
</tbody>
</table>

### 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 (moved)
- **Wires:** PP 2 x 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)

<table>
<thead>
<tr>
<th>Length</th>
<th>Type</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 m</td>
<td>EEM 33-41</td>
<td>056141</td>
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<tr>
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<td>EEM 33-42</td>
<td>056142</td>
</tr>
<tr>
<td>10 m</td>
<td>EEM 33-43</td>
<td>056143</td>
</tr>
</tbody>
</table>

### 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)

#### Pin assignment
- 1 = Shield
- 2 = Red (0,34 mm²)
- 3 = Black (0,34 mm²)
- 4 = White (0,25 mm²)
- 5 = Blue (0,25 mm²)

<table>
<thead>
<tr>
<th>Length</th>
<th>Type</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 m</td>
<td>EEM 33-44</td>
<td>056144</td>
</tr>
</tbody>
</table>

---

**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

Ordering specifications

<table>
<thead>
<tr>
<th>MAP</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>Adjustble Excitation voltage (5...24 V/Max. 1.2 W)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>00: 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: 80...250 V AC/DC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number comparator relays
0: none
2: 2 relays
4: 4 relays

Analog output
0: no analog output
1: analog output present

Interface
0: ni interface
1: RS 232
2: RS 485

Display colour
1: Red

Data storage (only with interface)
0: not storage
1: RTC storage
2: FAST storage
Connecting Options
on request

M12 connector
• Customized lengths
• 3-, 4-, 6- and 8-pole versions
• Protection class IP67
• 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

Molex Mini Fit
• Customized length and lead wires
• 3-, 4-, 6- and 8-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.