Special features
- very robust design to extreme environmental conditions
- high shaft load 300 N
- non-contacting, magnetic
- measuring angles up to 360° in single and multi-channel versions
- enhanced corrosion protection by anodized aluminum housing and stainless steel shaft, salt spray resistant
- very good linearity
- resolution 14 bit
- unlimited mechanically rotatable
- absolutely impermeable to splash-water IP6K9K
- high temperature resistance
- long life >100 million movements, even at vibration-loaded mounting positions
- For highest EMC requirements such as ISO pulses and interference fields according to ISO 11452 and ECE directive
- Suitable for use in safety-related applications according to ISO 13849

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

The angle sensor RSX-7900 is designed for use in mobile applications under extreme environmental conditions. The sensor is suitable for a continuously ambitious operating.

The robust full metal housing with a double ball bearing stainless steel shaft and a superior seal concept protects the sensor against various environmental influences.

The high accuracy and reliability of the magnetic angle measurement are further features, particularly in safety-related applications.

The massive but compact design allows direct mounting of the sensor without additional protective measures. A variety of shaft versions allows guidance via lever arm or other driving elements.

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Mechanical Data

Dimensions

see dimension drawing

Mounting

with 4 screws \( M6 \), screw-in depth 15 mm min.

Starting torque of mounting screws

8 \( \times \) 1 Nm

Mechanical travel

360 continuous °

Permitted shaft loading (axial and radial) static or dynamic force

300 N

Torque *

max. 4 Ncm

Maximum operational speed

50 min-1

Weight

approx. 500 g

Environmental Data

Operating temperature

-40 ... +85 (analog), -40 ... +105 (CAN) °C

Vibration (IEC 60068-2-6)

5 ... 2000 Hz

Amax = 0.75

amax = 20 mm

Shock (IEC 60068-2-27)

50 (6 ms) g

Protection class (DIN EN 60529)

IP67 M12 connector outlet

IP6K9K cable outlet

Life

>100x10⁶ movements

*) Depending on the environmental temperature and standstill time, the necessary force for the initial operating of the shaft may increase.

CAD data see www.novotechnik.de/endownloads/cad-data/
Characteristics

- One channel, rising cw
- One channel, rising ccw
- Crossed characteristics, channel 1 cw
- On request:
  - Trapazoid characteristic
  - Different gradients
  - 2 staggered characteristics
  - Parabolic characteristic
- On request:
  - Two channel, signal 2 = 0.5 x signal 1
### Technical Data

#### Analog Interface - Current

<table>
<thead>
<tr>
<th>Electrical Data</th>
<th>RSX-79 _ _ _ _ _ _ _ _ _ _ analog Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current voltage Ub</td>
<td>12/24 (9 ... 34) VDC</td>
</tr>
<tr>
<td>Current consumption (w/o load) typical</td>
<td>20 per channel, supply voltage Ub = 24 V mA</td>
</tr>
<tr>
<td>Reverse voltage yes</td>
<td></td>
</tr>
<tr>
<td>Short circuit protection yes, all outputs vs. GND and supply voltage Ub</td>
<td></td>
</tr>
<tr>
<td>Measuring range</td>
<td>60, 120, 180, 240, 300, 360</td>
</tr>
<tr>
<td>Number of channels</td>
<td>1 / 2</td>
</tr>
<tr>
<td>Update rate</td>
<td>5 kHz</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit</td>
</tr>
<tr>
<td>Repeatability</td>
<td>0.2 °</td>
</tr>
<tr>
<td>Hysteresis at measuring range &lt; 360°</td>
<td>0.1 °</td>
</tr>
<tr>
<td>Hysteresis at measuring range 360°</td>
<td>0.25 (lower hysteresis on request)</td>
</tr>
<tr>
<td>Absolute linearity at measuring range &lt; 90°</td>
<td>2.0 %FS</td>
</tr>
<tr>
<td>Absolute linearity at measuring range ≥ 90°</td>
<td>1.0 %FS</td>
</tr>
<tr>
<td>Interlinearity at measuring range &lt; 90°</td>
<td>4.0 %FS</td>
</tr>
<tr>
<td>Interlinearity at measuring range ≥ 90°</td>
<td>2.0 %FS</td>
</tr>
<tr>
<td>Output signal</td>
<td>4 ... 20 (burden max. 250 Ω) mA</td>
</tr>
<tr>
<td>Temperature error at measuring range &lt; 90°</td>
<td>200 ppm/K</td>
</tr>
<tr>
<td>Temperature error at measuring range ≥ 90°</td>
<td>160 ppm/K</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>≥ 10 MΩ</td>
</tr>
<tr>
<td>Cross-section cable</td>
<td>0.5 (AWG 20) mm²</td>
</tr>
</tbody>
</table>

#### EMC Conformity

ISO 10605 Packaging and Handling + Component Test (ESD) 8 kV, 15 kV
ISO 11452-2 Radiated EM HF-Fields, Absorber Hall: 100 V/m
ISO 11452-5 Radiated EM HF-Fields, Stripline 200 V/m
CISPR 25 Radiated and conducted emission class 5
ISO 7637-2 Pulse 1, 2a, 3a, 4, 5 SG 4
ISO 7637-3 Transient emission SG 4
Interference emission and immunity according to ECE R10 (E1)

#### Functional Safety

Suitable for safety-relevant applications according to ISO 13849 after customer validation. Further safety data (DCavg...) and support for functional safety are available on request.

MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc) 46 (per channel) years
MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc) 92 (per channel) years

#### Pin assignment

<table>
<thead>
<tr>
<th>Single channel version</th>
<th>Cable (Code -252)</th>
<th>M12 connector (Code -551)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Ub</td>
<td>GN</td>
<td>Pin 1</td>
</tr>
<tr>
<td>GND</td>
<td>BN</td>
<td>Pin 3</td>
</tr>
<tr>
<td>Signal</td>
<td>WH</td>
<td>Pin 2</td>
</tr>
<tr>
<td>Not assigned</td>
<td>YE</td>
<td>Pin 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Partly redundant version</th>
<th>Cable (Code -252)</th>
<th>M12 connector (Code -551)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Ub</td>
<td>GN</td>
<td>Pin 1</td>
</tr>
<tr>
<td>GND</td>
<td>BN</td>
<td>Pin 3</td>
</tr>
<tr>
<td>Signal 1</td>
<td>WH</td>
<td>Pin 2</td>
</tr>
<tr>
<td>Signal 2</td>
<td>YE</td>
<td>Pin 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fully redundant version</th>
<th>2 x Cable (Code -352)</th>
<th>2 x M12 connector (Code -651)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Ub 1</td>
<td>Channel 1 / GN</td>
<td>Channel 1 / Pin 1</td>
</tr>
<tr>
<td>GND 1</td>
<td>Channel 1 / BN</td>
<td>Channel 1 / Pin 3</td>
</tr>
<tr>
<td>Signal 1</td>
<td>Channel 1 / WH</td>
<td>Channel 1 / Pin 2</td>
</tr>
<tr>
<td>Supply Ub 2</td>
<td>Channel 2 / GN</td>
<td>Channel 2 / Pin 1</td>
</tr>
<tr>
<td>GND 2</td>
<td>Channel 2 / BN</td>
<td>Channel 2 / Pin 3</td>
</tr>
<tr>
<td>Signal 2</td>
<td>Channel 2 / YE</td>
<td>Channel 2 / Pin 4</td>
</tr>
<tr>
<td>Not assigned</td>
<td>Channel 1 / YE</td>
<td>Channel 1 / Pin 4</td>
</tr>
<tr>
<td>Channel 2 / WH</td>
<td>Channel 2 / Pin 2</td>
<td></td>
</tr>
</tbody>
</table>
Ordering specifications

Analog Interface
- Current

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

Output signal
2: 4 mA ... 20 mA
Other output signals on request

Output characteristic
1: rising CW
2: rising CCW
3: Partly redundant version: crossed output channel 1 rising / channel 2 falling CW
4: Fully redundant version: crossed output channel 1 rising / channel 2 falling CW
Other characteristics on request

Electrical connection
single channel / partly redundant version: 1 output
252: 1 x cable 4-pole, 2 m, unshielded
551: 1 x connector M12, 4-pin, unshielded
Fully redundant version: 2 outputs
352: 2 x cable 4-pole, 2 m, unshielded
651: 2 x connector M12, 4-pin, unshielded
Cable versions and assembled connectors on request

Ordering specifications
Preferred types printed in bold

Series
R  S  X  7  9  1  1  8  3  6  3  2  4  3  5  2

Measuring range
06: 60°
12: 120°
18: 180°
24: 240°
30: 300°
36: 360°
Other angles on request

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

Shaft
1: Ø 13x12 mm with cross hole Ø 4,1 mm
3: Ø 10x16 mm with countersink Ø 4.5x90°
Other shaft versions on request

Housing
1: Centering shaft side
4: Centering shaft and cover side

Model / size
79: 79 x 35 mm
## Technical Data

### Type Designations
- RSX-79 _-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>Number of channels</td>
<td>1 / 2</td>
</tr>
<tr>
<td>Output signal / protocol</td>
<td>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</td>
</tr>
<tr>
<td>Programmable parameter</td>
<td>Position, speed, cams, working areas, rotating direction, scale, offset, node-ID, baud rate</td>
</tr>
<tr>
<td>Node-ID</td>
<td>1 ... 127 (default 127)</td>
</tr>
<tr>
<td>Baud rate</td>
<td>50 ... 1000 kbps</td>
</tr>
<tr>
<td>Resolution across 360° (position)</td>
<td>14 bit</td>
</tr>
<tr>
<td>Resolution speed</td>
<td>360°/2° = 0.022 °/ms</td>
</tr>
<tr>
<td>Update rate</td>
<td>1 kHz</td>
</tr>
<tr>
<td>Independent linearity</td>
<td>one-channel: &lt; 0.5 / two-channel: &lt; 0.85 %FS</td>
</tr>
<tr>
<td>Repeatability</td>
<td>&lt; 0.36 °</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>&lt; 0.36 °</td>
</tr>
<tr>
<td>Temperature error</td>
<td>0.2 ±% FS</td>
</tr>
<tr>
<td>Supply voltage Ub</td>
<td>12/24 (8 ... 34) 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 supply voltage Ub (up to 40 VDC)</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>&lt; 45 (permanent) VDC</td>
</tr>
<tr>
<td>Insulation resistance (500 VDC)</td>
<td>≥ 10 MΩ</td>
</tr>
<tr>
<td>Cross-section cable</td>
<td>0.5 (AWG 20) mm²</td>
</tr>
<tr>
<td>Bus termination interval</td>
<td>120, optionally 0Ω</td>
</tr>
</tbody>
</table>

### Environmental Data
- MTTF (DIN EN ISO 13849-1 parts count method, w/o load, wc) one-channel: 61 / two-channel: 58 (per channel) years
- Functional safety: If you need assistance in using our products in safety-related systems, please contact us
- EMC compatibility: ISO 10605 Packaging and Handling + Component Test 8 kV
- ISO 11452-2 Radiated EMF fields, Absorberhall 100 V/m
- ISO 11452-5 Radiated EMF fields, Stripline 200 V/m
- CISPR 25 Radiated emission class 3
- ISO 7637-2 Pulse 1, 2a, 2b, 3a, 3b, 4, 5 SG 3
- ISO 7637-3 Transient transmission SG 4
- EN 13309 Construction machinery
- Interference emission and immunity according to ECE-R10 (E1)

### Connection assignment

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable Code</th>
<th>Connector M12 Code</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN_SHLD</td>
<td>2 ... / 3</td>
<td>5 ... / 6</td>
<td>1</td>
</tr>
<tr>
<td>Supply voltage Ub</td>
<td>WH</td>
<td>BN</td>
<td>2</td>
</tr>
<tr>
<td>GND</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CAN_H</td>
<td>YE</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>CAN_L</td>
<td>GN</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

Cable shielding connect to GND.
## Ordering specifications

Preferred types printed in bold

<table>
<thead>
<tr>
<th>Series</th>
<th>Shaft</th>
<th>Housing</th>
<th>Model / size</th>
</tr>
</thead>
<tbody>
<tr>
<td>R S X - 7</td>
<td>9</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### Interface

6: CANopen Interface

**Interface parameters CANopen 6**

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

**Baud rate**

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

### Electrical connection

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

**Model / size**

79: 79 x 35 mm
**Z-IPX-M01**
Lever arm 165 x 20 mm for pivot head drive
- aluminum, anodized
- for shaft REX-79_1-
- P/N 400105430
Assembly material (screw, locking pin) included in delivery

**Z-IPX-M11**
Lever arm 185 x 20 mm for lever arm drive, clamp connection on dimension 20 mm
- aluminum, anodized
- for shaft REX-79_1-
- P/N 400105431
Assembly material (screw, locking pin) included in delivery

**Z-IPX-M21**
Driving plate D = 55 mm for lateral shaft drive with locking pin
- aluminum, anodized
- for shaft IPX-79_1-
- P/N 400105433
Assembly material (locking pin) included in delivery

**Z-IPX-M31**
Mounting plate for adjustable mounting on screw-hole circle 100 mm
- aluminum, anodized
- P/N 400105432
Assembly material (6 x countersink screw) included in delivery
## Accessories

### Connector System M12

<table>
<thead>
<tr>
<th>Connector Housing</th>
<th>Plastic</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>M12x1 Mating female connector, 4-pin, straight, A-coded, with coupling nut, screw termination, IP67, not shieldable</td>
<td>PBT</td>
<td>-25 °C...+90 °C</td>
</tr>
<tr>
<td>M12x1 Mating female connector, 4-pin, angled, A-coded, with coupling nut, screw termination, IP67, not shieldable</td>
<td>PBT</td>
<td>-25 °C...+90 °C</td>
</tr>
<tr>
<td>M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, not shielded, IP67, open ended</td>
<td>PA</td>
<td>-40 °C...+85 °C (fixed)</td>
</tr>
</tbody>
</table>

### Pin Assignment

<table>
<thead>
<tr>
<th>Pin Assignment</th>
<th>M12x1 Mating female connector, 4-pin, straight, A-coded, with coupling nut, screw termination, IP67, not shieldable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = brown</td>
<td>2 = white</td>
</tr>
<tr>
<td>3 = blue</td>
<td>4 = black</td>
</tr>
<tr>
<td>M12x1 Mating female connector, 4-pin, angled, A-coded, with coupling nut, screw termination, IP67, not shieldable</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
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</tr>
<tr>
<td>3 = blue</td>
<td>4 = black</td>
</tr>
</tbody>
</table>

### Length and Type

<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>400056135</td>
</tr>
<tr>
<td>5 m</td>
<td>EEM 33-36</td>
<td>400056136</td>
</tr>
<tr>
<td>10 m</td>
<td>EEM 33-37</td>
<td>400056137</td>
</tr>
<tr>
<td>2 m</td>
<td>EEM 33-38</td>
<td>400056138</td>
</tr>
<tr>
<td>5 m</td>
<td>EEM 33-39</td>
<td>400056139</td>
</tr>
<tr>
<td>10 m</td>
<td>EEM 33-40</td>
<td>400056140</td>
</tr>
</tbody>
</table>

Accessories
Connector System M12

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

- **Connector housing**: Metal
- **Temperature range**: -40 °C...+85 °C
- **For wire gauge**: 6...8 mm, max. 0.75 mm²
- **Type**: EEM 33-73, P/N 400005645

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

- **Connector housing**: Metal
- **Temperature range**: -40 °C...+85 °C
- **For wire gauge**: 6...8 mm, max. 0.75 mm²
- **Type**: EEM 33-75, P/N 400005646
- **Note**: It is possible to turn and fix the contact carrier in 90° positions.

**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 2x 0.25 mm² + 2 x 0.34 mm²
- **Length**:
  - 2 m: EEM 33-41 400056141
  - 5 m: EEM 33-42 400056142
  - 10 m: EEM 33-43 400056143

**M12x1 Mating 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**:
  - 5 m: EEM 33-44 400056144

**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.

**Protection class to DIN EN 60529**

**CAN-bus**

**UL - approved**

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

**Very good resistance to oils, coolants and lubricants**
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.