NOVOTURN
Multiturn Sensor
Non-contacting
RSM-2800
Ratiometric

Special Features
• Non-contacting, magnetic
• Long life
• Measuring range 720° up to 5760° in 360°-steps (2 to 16 turns)
• True-Power-On system: counts turns even when not powered.
  Patented non-volatile technology does not require gears or batteries
• Available with push-on coupling or marked shaft
• Easy mounting
• Protection class IP54 up to IP67
• One or multi-channel versions
• Resolution 16 bits
• Linearity up to ±0,03 %
• Other configurations see separate data sheets

Applications
• Mechanical engineering
• Mobile machinery
• Driveline or steering systems
• Wire-actuated encoders
• Gate drives
• Motor sports

Multiturn sensors that use the GMR technology (giant magneto resistance), provide absolute position values, do not require any reference signals and need no power supply or buffer battery for detecting the revolutions. The fact that rotations are detected even unpowered and the sensor does not lose its position information during a power failure, makes the RSM-2800 with its diameter of only 28 mm an extremely compact real True-Power-On rotary sensor. The sensor operates magnetically and thus contactless allowing an extremely long life. The sensor is able to detect angular positions over 2 to 16 revolutions with a high resolution of 16 bits.

Description
Material
Housing: high grade, temperature resistant plastic PPS-GF40/SF50
Shaft: SS X9CrNiS18-9 1.4305 / AISI 303
Mounting
With 2 screws M4 and washers
Fastening torque of mounting
max. 180 Ncm
Bearing
Sintered bronze bushing
Electrical connection
Cable 4x 0.5 mm² (AWG 20), TPE, shielded / Connector M12x1, A-coded with cable L = 0.15 m

Mechanical Data
Dimensions
See dimension drawing
Mechanical travel
360° continuous
Permitted shaft load
static or dynamic
20 N (axial / radial)
Torque
0.15 Ncm (IP54), 0.5 Ncm (IP65), 1.0 Ncm (IP67)
Weight
approx. 50 g
## Ordering Specifications

**Preferred types printed in bold**

- Delivery time up to 25 pcs. within 10 working days EXW
- Best low-volume pricing

### Supply voltage Ub

1: 5 ... 95% ratio of the supply voltage Ub (0.25 ... 4.75 VDC)
2: 10 ... 90% ratio of the supply voltage Ub (0.5 ... 4.5 VDC)

#### Interface parameters

1: Rising characteristic c/w
2: Rising characteristic c/w
3: Crossed outputs, channel 1 rising c/w

Other output characteristics on request

### Output characteristic

- 201: Cable, 4-pole, shielded, L = 0.5 m
- 202: Cable, 4-pole, shielded, L = 1 m
- 206: Cable, 4-pole, shielded, L = 3 m
- 210: Cable, 4-pole, shielded, L = 5 m
- 220: Cable, 4-pole, shielded, L = 10 m
- 501: Connector M12x1, 4-pin, with cable, shielded, L = 0.15 m

Cable versions and assembled connectors on request

### Number of turns for output characteristic

- 002 ... 016: 2 up to 16 turns
- Increment 1 turn, X turns correspond to a measuring angle of X • 360°

### Mechanical version

- 2801: 6 m shaft with marking, IP54*
- 2831: 6 m shaft with marking, IP65*
- 2861: 6 m shaft with marking, IP67*
- 2802: 6 m shaft with flattening, IP54
- 2832: 6 m shaft with flattening, IP65
- 2862: 6 m shaft with flattening, IP67
- 2821: push-on coupling, IP04
- 2841: push-on coupling, IP65
- 2871: push-on coupling, IP67

Other shaft configurations on request

* Not recommended for new designs
When the marking of the shaft is pointing towards the electrical outlet, the sensor output is located on an integer turn position.
### Technical Data

<table>
<thead>
<tr>
<th>Type</th>
<th>RSM-28 - - - - - - 2 - - - - - -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output signal</td>
<td>ratiometric to supply voltage Ub</td>
</tr>
<tr>
<td>5 ... 95% (0.25 ... 4.75 V)</td>
<td>10 ... 90% (0.5 ... 4.5 V)</td>
</tr>
<tr>
<td>Load</td>
<td>≥ 10 kΩ</td>
</tr>
<tr>
<td>Number of channels</td>
<td>1 / 2</td>
</tr>
<tr>
<td>Start-up time</td>
<td>typ. 10 ms</td>
</tr>
<tr>
<td>Response time</td>
<td>max. 2 ms</td>
</tr>
<tr>
<td>Measuring range</td>
<td>0 ... 720° up to 0 ... 5760° in 360°-steps</td>
</tr>
<tr>
<td>Independent linearity</td>
<td>2 turns: typ. ±0.25 %FS, max. ±0.35 %FS</td>
</tr>
<tr>
<td>3 turns: typ. ±0.167 %FS, max. ±0.267 %FS</td>
<td></td>
</tr>
<tr>
<td>6 turns: typ. ±0.083 %FS, max. ±0.183 %FS</td>
<td></td>
</tr>
<tr>
<td>10 turns: typ. ±0.05 %FS, max. ±0.15 %FS</td>
<td></td>
</tr>
<tr>
<td>16 turns: typ. ±0.031 %FS, max. ±0.131 %FS</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>16 bits</td>
</tr>
<tr>
<td>Repeatability</td>
<td>≤ ±0.5°</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>≤ ±1°</td>
</tr>
<tr>
<td>Temperature error</td>
<td>±0.15 %FS</td>
</tr>
<tr>
<td>Supply voltage Ub</td>
<td>5 VDC (4.5 ... 5.5 VDC)</td>
</tr>
<tr>
<td>Current consumption w/o load</td>
<td>typ. 30 mA</td>
</tr>
<tr>
<td>Polarity protection</td>
<td>yes (supply lines and outputs)</td>
</tr>
<tr>
<td>Short circuit protection</td>
<td>yes (vs. UND and supply voltage)</td>
</tr>
<tr>
<td>Insulation resistance (500 VDC)</td>
<td>≥ 10 MΩ</td>
</tr>
</tbody>
</table>

### Environmental Data

| Max. operational speed | 800 rpm |
| Vibration (IEC 60068-2-6) | 20 g, 5 ... 2000 Hz, Amax = 0.75 mm |
| Shock (IEC 60068-2-27) | 50 g, 6 ms |
| Protection class DIN EN 60529 | IP54 / IP65 / IP67 |
| Operating temperature | -40 ... +85°C |
| -25 ... +85°C (connector M12) |
| Insensitivity to magnetic DC fields | ≤ 10 mT |
| Life | > 50 Mio. movements (mechanically) |
| MTTF (IEC 60050) | 175 years (per channel) |

### EMC Compatibility

- **EN 61000-4-2 ESD (contact/air discharge)**: 4 kV / 8 kV
- **EN 61000-4-3 Electromagnetic fields (RFI)**: 10 V/m
- **EN 61000-4-4 Fast transients (burst)**: 1 kV
- **EN 61000-4-6 Cond. disturbances (HF fields)**: 10 V eff.
- **EN 61000-4-8 Magnetic fields**: 30 A/m
- **EN 55011 Noise radiation**: Class B

### Connection Assignment

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code 2_ _</th>
<th>Connector code 5_ _</th>
<th>Cable code 2_ _</th>
<th>Connector code 5_ _</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Ub</td>
<td>GN</td>
<td>Pin 1</td>
<td>GN</td>
<td>Pin 1</td>
</tr>
<tr>
<td>GND</td>
<td>BN</td>
<td>Pin 3</td>
<td>BN</td>
<td>Pin 3</td>
</tr>
<tr>
<td>Signal output 1</td>
<td>WH</td>
<td>Pin 2</td>
<td>WH</td>
<td>Pin 2</td>
</tr>
<tr>
<td>Signal output 2</td>
<td>-</td>
<td>-</td>
<td>YE</td>
<td>Pin 4</td>
</tr>
<tr>
<td>Do not connect / not assigned</td>
<td>YE</td>
<td>Pin 4</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Connect cable shielding to GND
Technical Data
Output Characteristics

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Sensor Mounting

Z-106-G-_
Backlash-free, double cardanic shaft coupling for Ø6 mm to Ø6 mm, Ø6.35 mm or Ø10 mm, mounting via 2 threaded pins with internal hexagon.

- Material: Aluminium, PEEK
- Operating temp.: -40 ... +160°C
- Transferable torque: ≤ 1 Nm
- Displacement: rad. ≤ 0.1 mm, angl. ≤ 0.45°

<table>
<thead>
<tr>
<th>P/N</th>
<th>Type</th>
<th>ØA / ØB [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>400103910</td>
<td>Z-106-G-6</td>
<td>6 / 6</td>
</tr>
<tr>
<td>400103912</td>
<td>Z-106-G-6.35</td>
<td>6 / 6.35</td>
</tr>
<tr>
<td>400103913</td>
<td>Z-106-G-10</td>
<td>6 / 10</td>
</tr>
</tbody>
</table>

Z-104-G-6
Fork coupling with low backlash for Ø6 mm. Mounting with 2 cylinder head screws M3 with internal hexagon. Angle screwdriver DIN 911 AF 1.5 included in delivery.

- Material: SS, ground driving pin
- Displacement: ≤ 1 mm

<table>
<thead>
<tr>
<th>P/N</th>
<th>Type</th>
<th>ØA / ØB [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>400005690</td>
<td>Z-104-G-6</td>
<td>6 / 6</td>
</tr>
</tbody>
</table>

Z-105-G-6
Backlash-free fork coupling for Ø6 mm. Mounting with 1 cylinder head screw M3 with internal hexagon. Angle screwdriver DIN 911 AF 2.5 included in delivery.

- Material: Aluminium, anodized (black) Driving pin and spring hardened
- Transferable torque: ≤ 5 Ncm
- Displacement: ≤ 1 mm

<table>
<thead>
<tr>
<th>P/N</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>400005691</td>
<td>Z-105-G-6</td>
</tr>
</tbody>
</table>
### Connector System M12

**EEM-33-32/62/97**

M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

**Plug housing:** PA

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

**Lead wires:** PP, 0.34 mm²

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

**Protection classes:**
- **IP67:** Protection class IP67 DIN EN 60529
- **IP68:** Protection class IP68 DIN EN 60529

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

- **M12 connector**
  - Customized lengths
  - 3-, 4-, 6- and 6-pole versions
  - Protection class IP68
  - Ordering codes of standard versions see ordering specifications

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

- **Deutsch DTM 04**
  - Pin- and bushing housing
  - Customized lengths
  - 3-, 4- and 6-pole versions
  - Protection class IP67
  - On request

- **ITT Cannon Sure Seal connector**
  - Customized lengths
  - 3-, 4- and 6-pole versions
  - Protection class IP67
  - On request

- **Molex Mini Fit jr.**
  - Customized length and lead wires
  - 3-, 4- and 6-pole versions
  - On request
The specifications contained in our datasheets are intended solely for informational purposes. The documented specification values are based on ideal operational and environmental conditions and can vary significantly depending on the actual customer application. Using our products at or close to one or more of the specified performance ranges can lead to limitations regarding other performance parameters. It is therefore necessary that the end user verifies relevant performance parameters in the intended application. We reserve the right to change product specifications without notice.