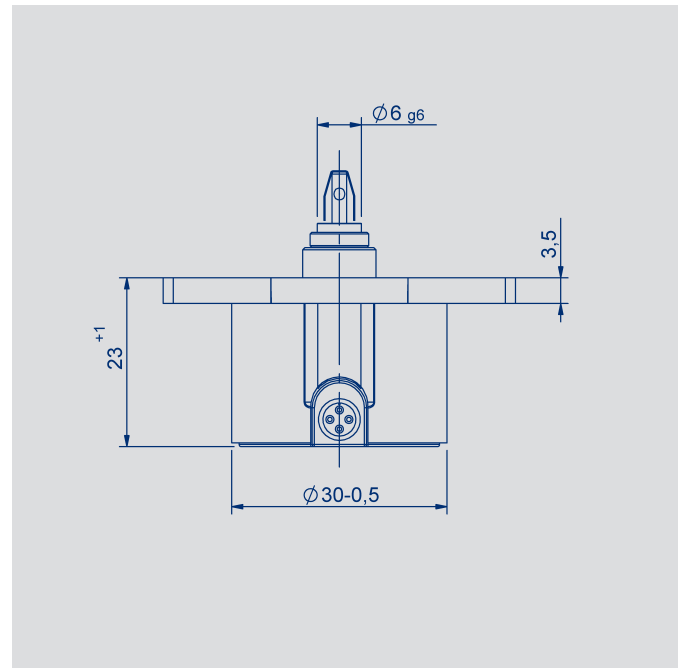


**NOVOTURN
Multiturn Sensor
non-contacting**

Series RSM-2800



Special features

- Non-contacting, magnetic
- Long life
- Electrical range 720° up to 5760° in 360°-steps available (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-channel or multi-channel
- Resolution up to 18 bit
- Linearity up to $\pm 0,03\%$

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**.

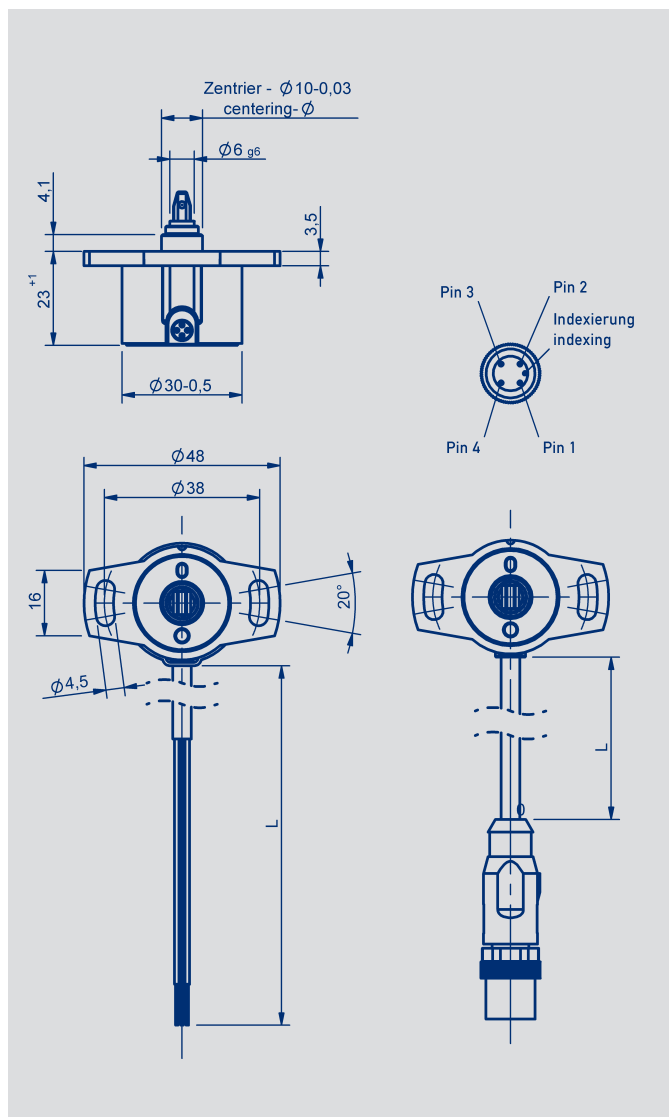
The sensor operates magnetically and thus contactless allowing an extremely long life.

The sensor is able to detect angular positions over 2 to 16 revolutions with a high resolution up to 18 bits.

Contents

| | |
|-------------------------------|----|
| Mechanical Data | 3 |
| Output Characteristics | 4 |
| <hr/> | |
| Analog versions | |
| Technical data | 5 |
| Ordering code | 6 |
| <hr/> | |
| Digital versions | |
| Technical data SSI | 7 |
| Technical data SPI | 8 |
| Ordering code | 9 |
| <hr/> | |
| Accessories | |
| M12 connector system | 10 |
| Signal processing | 11 |

Mechanical Data



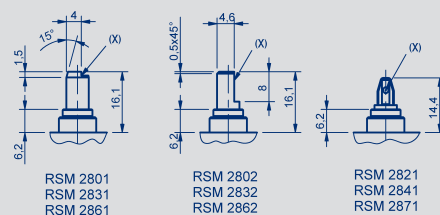
Description

| | |
|------------------------|---|
| Housing | High grade, temperature-resistant plastic, PPS-GF40 / SF50 |
| Shaft | Stainless steel, X8CrNiS18-9 1.4305 |
| Bearings | Sintered bronze bushing |
| Electrical connections | Cable 4 x 0.5 mm ² , AWG 20, TPE insulated, shielded (voltage / current) Cable 4 x 2 x 0.25 mm ² , AWG 24, TPE insulated, shielded (SSI) Cable 5 x 0.14 mm ² , AWG 26, PUR insulated, shielded (SPI) Connector M12x1, 4-pin / 8-pin on cable L = 0,15 m |

Mechanical Data

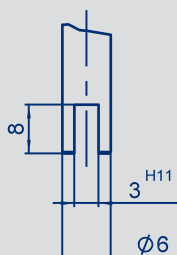
| | | |
|---|--|---------------|
| Dimensions | see dimension drawing | |
| Mounting | 2 screws M4 and washers | |
| Starting torque of mounting screws | 180 | Ncm |
| Mechanical travel | 360 continuous | ° |
| Permitted shaft load (axial and radial) static or dynamic force | 20 | N |
| Torque | 0,15 (IP54), 0,5 (IP65) 1,0 (IP67) | Ncm |
| Permitted operational speed | 800 | min-1 |
| Weight | approx. 50 | g |
| Insensitiv to constant magnetic fields | <15 | mT |
| Vibration (IEC 68000-2-6) | 5 ... 2000 Amax = 0.75 amax = 20 | Hz mm g |
| Shock (IEC 68000-2-27) | 50 (6 ms) | g |
| Protection class (DIN EN 60529) | IP54 / IP65 / IP67 | |
| Operating temperature | -40 ... +85 (-25 ... +85 with M12 connector) ° | |
| Life | >50 x 10 ⁶ (mechanically) movem. | |

Shaft designs

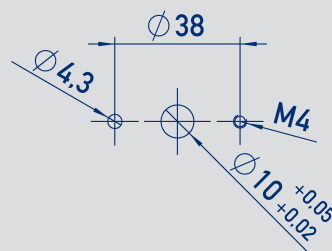


(X) = Wellenmarkierung / shaft marking

Recommended dimensions of driving shaft for RSM-2821 / RSM-2841 and RSM-2871
Parallel offset < 0.05 mm.

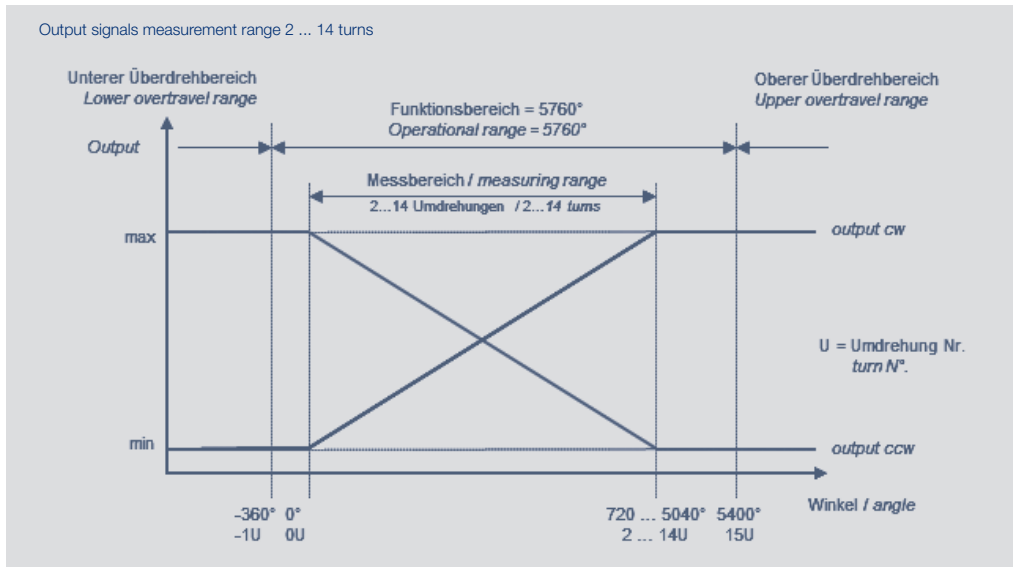


Recommended hole pattern
2 x $\varnothing 4.3$ or 2 x M4

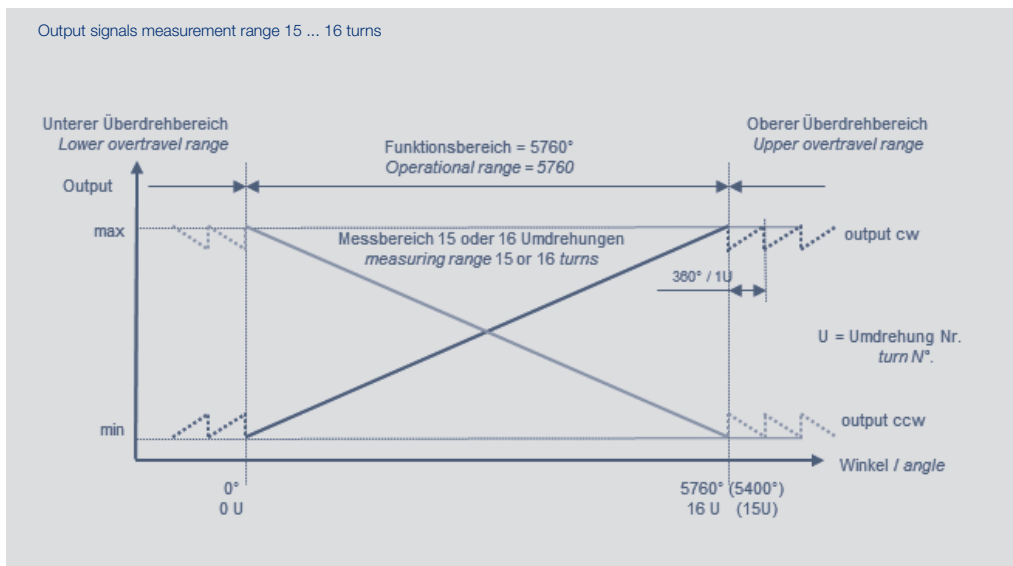


Output Characteristics

Output signals measurement range 2 ... 14 turns



Output signals measurement range 15 ... 16 turns



**Technical Data
Analog Versions
- Voltage
- Current**

| Type Designations | RSM - 28 _ _ _ _ _ 2 _ _ _ _ _ Ratiometric | RSM - 28 _ _ _ _ _ 11 _ _ _ _ _ Analog voltage | RSM - 28 _ _ _ _ _ 12 _ _ _ _ _ Analog current | | | | | | | | | | | | |
|---|---|---|---|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Electrical Data | | | | | | | | | | | | | | | |
| Output signal | ratiometric load $\geq 10\text{ k}\Omega$ | 0.1 ... 10 V load $\geq 10\text{ k}\Omega$ | 4 ... 20 mA burden $\leq 500\ \Omega$ | | | | | | | | | | | | |
| Number of channels | 1 / 2 | 1 / 2 | 1 | | | | | | | | | | | | |
| Measuring range | 0 ... 720° up to 0 ... 5760 (360° steps) | | | ° | | | | | | | | | | | |
| Independent linearity | 0.25 ... 0.031 (see table below) | | | ±% FS | | | | | | | | | | | |
| Start-up time | typ. 10 | | | ms | | | | | | | | | | | |
| Response time | max. 2 | | | ms | | | | | | | | | | | |
| Repeatability | ≤ 0.5 | | | ±° | | | | | | | | | | | |
| Hysteresis | ≤ 1 | | | ° | | | | | | | | | | | |
| Temperature error | ≤ 0.15 | ≤ 0.31 | ≤ 0.625 | ±% FS | | | | | | | | | | | |
| Supply voltage U_b | 5 (4.5 ... 5.5) | 24 (18 ... 30) | 24 (18 ... 30) | | | | | | | | | | | | |
| Current consumption (w/o load) | typ. 30 | | | mA | | | | | | | | | | | |
| Reverse voltage | yes, supply lines and outputs | | | | | | | | | | | | | | |
| Short circuit protection | yes (vs. supply voltage and GND) | | | | | | | | | | | | | | |
| Insulation resistance (500 VDC) | ≥ 10 | | | M Ω | | | | | | | | | | | |
| Cross-section cable | AWG 26, 0.14 (AWG 20, 0.5)* | | | mm ² | | | | | | | | | | | |
| Environmental Data | | | | | | | | | | | | | | | |
| MTTF (DIN EN ISO 13849-1 parts count method. w/o load) | 175 single 175 (per channel, at 2 outputs) | 184 single 184 (per channel, at 2 outputs) | 186 | years 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 discharges (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 | | | | | | | | | | | | | | |
| Linearities | | | | | | | | | | | | | | | |
| Measuring range | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Linearity typ. | 0.250 | 0.167 | 0.125 | 0.100 | 0.083 | 0.071 | 0.063 | 0.056 | 0.050 | 0.045 | 0.042 | 0.039 | 0.036 | 0.033 | 0.031 |
| Linearity max. | 0.350 | 0.267 | 0.225 | 0.200 | 0.183 | 0.171 | 0.163 | 0.156 | 0.150 | 0.145 | 0.142 | 0.138 | 0.136 | 0.133 | 0.131 |

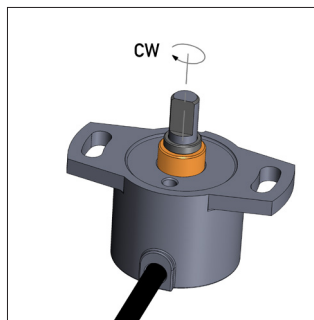


*) The cross-sections of the lead wires will be increased to 0.5 mm².
The changeover is carried out depending on model type and starts from Q1-2016.
For questions, please call your local distributor or our hotline on +49 711 4489 250.

Connection assignment

| Signal | Cable code 2 _ _ | M12 connector code 501 |
|-------------------------|------------------|------------------------|
| Supply voltage U_b | GN | pin 1 |
| Output 1 | WH | pin 2 |
| GND | BN | pin 3 |
| Output 2 / Not assigned | YE | pin 4 |

Cable shielding connect to GND.



When the shaft marking points towards the cable outlet, the sensor is located on an integer turn position.

Ordering Code Analog versions

Ordering specifications

Preferred types printed in bold:

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

Supply voltage Ub

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

Output signal - supply voltage = 24 V

- 1: 0.1 ... 10 V
2: 4 ... 20 mA

Output signal - supply voltage = 5 V

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

Output characteristics

- 1: Rising cw
2: Rising ccw
3: 2 crossed characteristics, channel 1 rising / channel 2 falling cw
(only at supply voltage = 5 V or voltage output 0 ... 10 V)
Other output characteristics on request

Electrical connection

- 201: Cable 4-pole, L = 0.5 m, shielded
202: Cable 4-pole, L = 1 m, shielded
206: Cable 4-pole, L = 3 m, shielded
210: Cable 4-pole, L = 5 m, shielded
220: Cable 4-pole, L = 10 m, shielded
501: Connector M12, 4-pin, on cable, L = 0.15 m, shielded
Cable versions and assembled connectors on request

R S M - 2 8 3 2 - 0 1 0 - 1 1 1 - 2 0 2

Series

Mechanical version

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

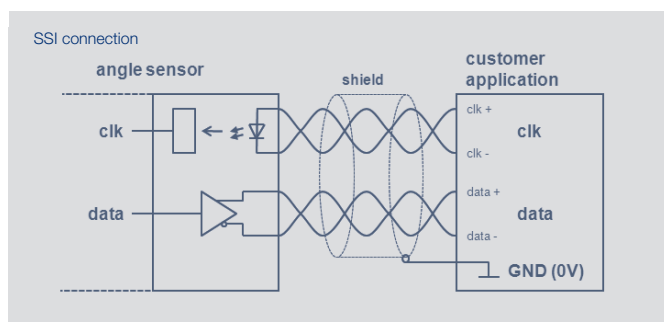
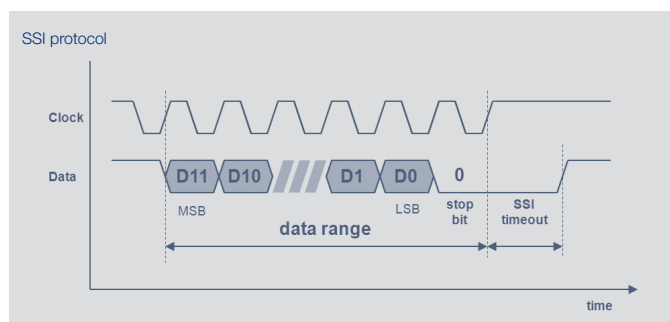
Number of turns for output characteristic

- 002 = 2 turns up to 016 = 16 turns, increment 1 revolution
003, 006, 010, 016
Other measuring angles on request

X Revolutions correspond to a measuring angle of X • 360°
* Not recommended for new designs

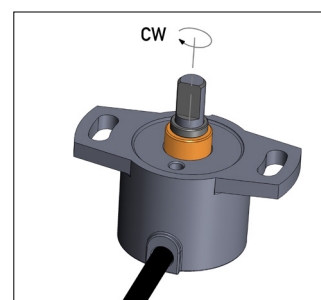
Technical Data SSI interface

| Type Designations | RSM - 28__ - 2__ - 14_ - ___ Supply voltage 24 VDC | RSM - 28__ - 2__ - 24_ - ___ Supply voltage 5 VDC | |
|--|---|--|------------------|
| Electrical Data | | | |
| Protocol | SSI | | |
| Coding | Gray code, binary code | | |
| Monoflop time (tm) | 20 ±1 | | µs |
| Update rate (internal) | 1 | | kHz |
| Resolution output signal | 16 or 18 over the entire measuring range | | Bit |
| Measuring range | see ordering code | | |
| Absolute linearity | 14 revolutions: ≤ 0.036 16 revolutions: ≤ 0.031 | | ± % FS ± % FS |
| Repeatability | ≤ 0.5 | | ± ° |
| Hysteresis | ≤ 1 | | ° |
| Temperature error | ≤ 0.1 | | ± % FS |
| Supply voltage Ub | 24 (10 ... 32) | 5 (4.5 ... 5.5) | V |
| Current consumption (w/o load) | typ. 10 | typ. 20 | mA |
| Reverse voltage | yes, supply lines and outputs | | |
| Short circuit protection | yes (vs. GND, max. 1 min.) | yes (vs. GND and supply voltage, max. 10 min.) | |
| Inputs | RS 422 compatible, CLK-lines electrically isolated via optocouplers | | |
| Ohmic load at outputs | ≥ 120 | | Ω |
| Max. clock rate | 100 | | kHz |
| Insulation resistance (500 VDC) | ≥ 10 | | MΩ |
| Cross-section cable | AWG 24, 0.25 | | mm² |
| Environmental Data | | | |
| MTTF (DIN EN ISO 13849-1 parts count method, w/o load) | 173 | 179 | 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 discharges (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 55016-2-3 radiated disturbances class B | | |



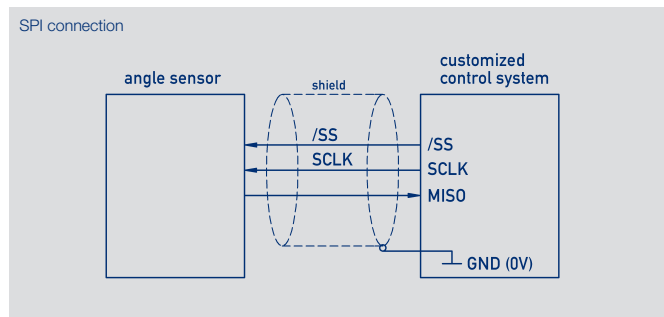
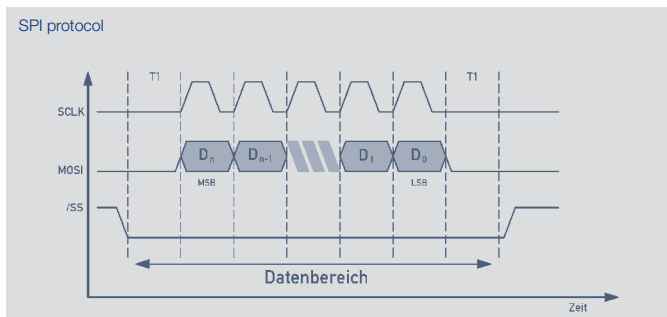
| Connection assignment | | |
|-------------------------|-----------------|----------------------|
| Signal | Cable Code 4 __ | Stecker M12 Code 531 |
| Supply voltage Ub | WH | pin 1 |
| GND | BN | pin 2 |
| Clock input SSI Clk- | GN | pin 3 |
| Clock input SSI Clk+ | YE | pin 4 |
| Signal output SSI Data- | GY | pin 5 |
| Signal output SSI Data+ | PK | pin 6 |
| Not assigned | BU | pin 7 |
| Not assigned | RD | pin 8 |

When the shaft marking points towards the cable outlet, the sensor is located on an integer turn position.



Technical Data SPI interface

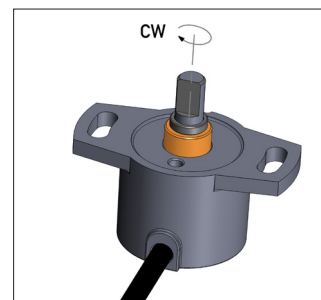
| | | |
|--|--|-----------------|
| Type Designations | RSM - 28 _ _ - 2 _ _ - 2 8 _ - _ _ _ Supply voltage 5 VDC | |
| Electrical Data | | |
| Protocol | SPI | |
| Coding | binary code | |
| Level SCLK, MISO, /SS | TTL level | |
| Update rate (internal) | 1 | kHz |
| Resolution | 16 over the entire measuring range | Bit |
| Measuring range | see ordering code | |
| Absolute linearity | 14 revolutions: ≤ 0.036 | \pm % FS |
| | 16 revolutions: ≤ 0.031 | \pm % FS |
| Repeatability | ≤ 0.5 | \pm ° |
| Hysteresis | ≤ 1 | ° |
| Temperature error | ≤ 0.1 | \pm % FS |
| Supply voltage U_b | 5 (4.5 ... 5.5) | V |
| Current consumption (w/o load) | typ. 25 | mA |
| Reverse voltage | yes, supply lines and outputs | |
| Short circuit protection | yes (vs. GND and supply voltage) | |
| Max. clock rate | 100 | kHz |
| Insulation resistance (500 VDC) | ≥ 10 | M Ω |
| Cross-section cable | AWG 26, 0.14 | mm ² |
| Environmental Data | | |
| MTTF (DIN EN ISO 13849-1 parts count method, w/o load) | 193 | 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 discharges (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/m eff. EN 61000-4-8 Power frequency magnetic fields 3 A/m EN 55016-2-3 radiated disturbances class B | |



Connection assignment

| Signal | Cable Code 302 |
|----------------------|----------------|
| Supply voltage U_b | GN |
| GND | BN |
| MISO | YE |
| SCLK | GY |
| /SS (slave select) | WH |

When the shaft marking points towards the cable outlet, the sensor is located on an integer turn position.



Ordering Code
Digitale Varianten
- SSI
- SPI

Ordering specifications

Preferred types printed in bold:

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

Supply voltage Ub

- 1: Ub = 24 V (10 ... 32 V)**
2: Ub = 5 V (4.5 ... 5.5 V)

Interface parameters for SSI Interface

- 41: SSI 16 bit, Gray code, rising cw**
42: SSI 16 bit, Gray code, rising ccw
43: SSI 25 bit (18 bit data), Gray code, rising cw
44: SSI 25 bit (18 bit data), Gray code, rising ccw
45: SSI 16 bit, binary code, rising cw
46: SSI 16 bit, binary code, rising ccw
47: SSI 25 bit (18 bit data), binary code, rising cw
48: SSI 25 bit (18 bit data), binary code, rising ccw

Interface parameters for SPI Interface (only supply voltage Ub = 5 V)

- 81: SPI 16 bit, binary code, rising cw**
82: SPI 16 bit, binary code, rising ccw

Electrical connection

- SSI:**
432: Cable 8-pole, shielded, L = 1 m
436: Cable 8-pole, shielded, L = 3 m
440: Cable 8-pole, shielded, L = 5 m
450: Cable 8-pole, shielded, L = 10 m
531: Connector M12, 8-pin, on cable, L = 0.15 m, shielded
SPI
302: Cable 5-pole, shielded, L = 1 m
Cable versions and assembled connectors on request

R S M - 2 8 3 2 - 2 1 4 - 2 8 1 - 3 0 2

Series

Mechanical version

- 2802: 6 mm-shaft with flattening, IP54
2832: 6 mm-shaft with flattening, IP65
2862: 6 mm-shaft with flattening, IP67
2821: push-on coupling, IP54
2841: push-on coupling, IP65
2871: push-on coupling, IP67
Other shaft versions on request

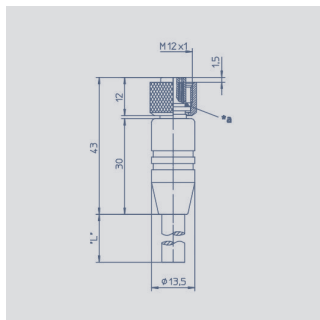
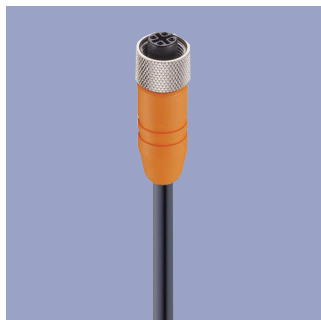
Number of turns for output characteristic

- 14: 14 turns = 5040°, measuring range controlled**
16: 16 turns = 5760°, measuring range not controlled

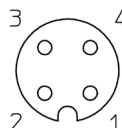
Interface

- 2: Digital interface**

Accessories
Connector system M12

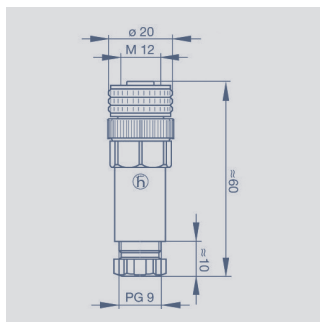


Pin assignment
 1 = brown
 2 = white
 3 = blue
 4 = black

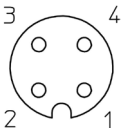


M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

| | | |
|-------------------|---|------------|
| Connector housing | Plastic PA | |
| Cable sheath | PUR; Ø = max. 6 mm, -25 °C...+80 °C (moved) -50 °C...+80 °C (fixed) | |
| Wires | PP, 0.34 mm ² | |
| Length | Type | P/N |
| 2 m | EEM 33-32 | 005600 |
| 5 m | EEM 33-62 | 005609 |
| 10 m | EEM 33-97 | 005650 |

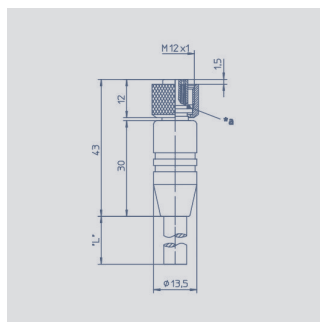
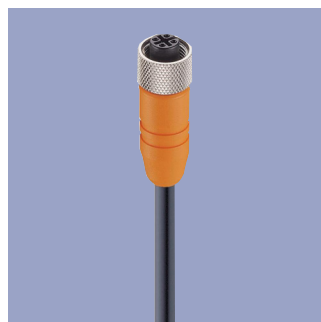


Pin assignment

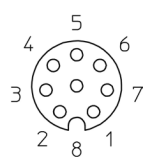


M12x1 Mating female connector, 4-pin, straight, A-coded, with coupling nut, screw termination, IP67, not shielded

| | | |
|-------------------|-------------------------------------|--|
| Connector housing | Plastic PBT | |
| housing | -25 °C...+90 °C | |
| For wire gauge | 6...8 mm, max. 0.75 mm ² | |
| Type | EEM 33-88, P/N 005633 | |



Pin assignment
 1 = white
 2 = brown
 3 = green
 4 = yellow
 5 = grey
 6 = pink
 7 = blue
 8 = red



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

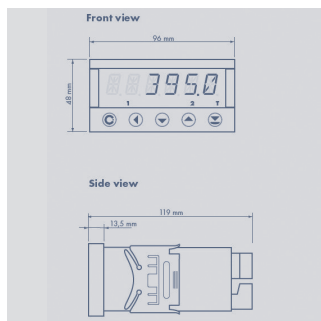
| | | |
|-------------------|---|------------|
| Connector housing | Plastic PA | |
| Cable sheath | PUR; Ø = max. 8 mm, -25 °C...+80 °C (moved) -50 °C...+80 °C (fixed) | |
| Wires | PP, 0.25 mm ² | |
| Length | Type | P/N |
| 2 m | EEM 33-86 | 005629 |
| 5 m | EEM 33-90 | 005635 |
| 10 m | EEM 33-92 | 005637 |

**Multifunctional
Measuring Device
with Display
Series MAP-4000**

Novotechnik
Messwertaufnehmer OHG
Postfach 4220
73745 Ostfildern (Ruit)
Horbstraße 12
73760 Ostfildern (Ruit)
Telefon +49 711 4489-0
Telefax +49 711 4489-118
info@novotechnik.de
www.novotechnik.de



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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

Number comparator relays

- 0: none
- 2: 2 relays
- 4: 4 relays

Analog output

- 0: no analog output
- 1: analog output present

Interface

- 0: no interface
- 1: RS 232
- 2: RS 485

M A P - 4 0 1 0 - 0 0 0 - 1 0 1

Display colour
1: red

Data storage (only with interface)

- 0: not storage
- 1: RTC storage
- 2: FAST storage

Series

Supply voltage U_b
00: 10 ... 30 V AC/DC
10: 80 ... 250 V AC

Adjustable supply voltage (5 ... 24 V / max. 1.2 W)
1: with supply voltage