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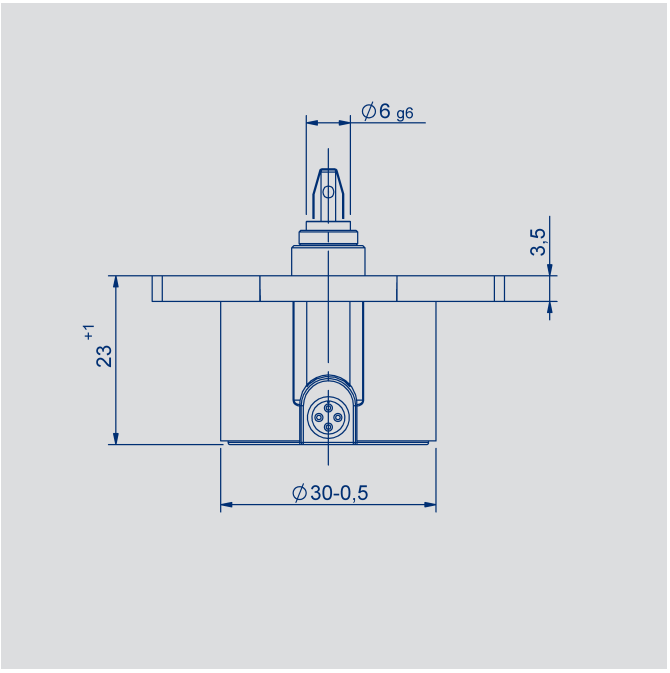
NOVOTURN
Multiturn Sensor
non-contacting

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 ±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.

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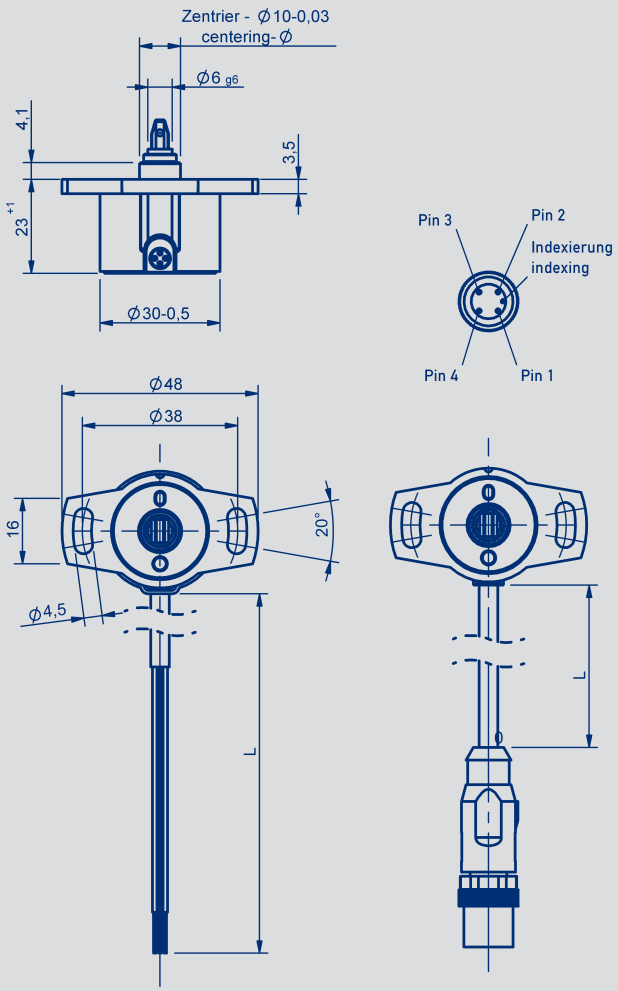
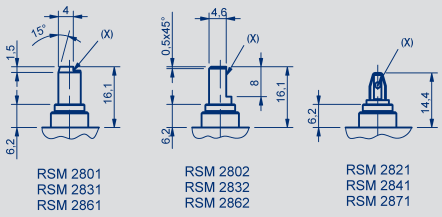
Contents

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 mm², AWG 20, TPE insulated, shielded (voltage / current) Cable 4 x 2 x 0.25 mm², AWG 24, TPE insulated, shielded (SSI) Cable 5 x 0,14 mm², 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 continous	°
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



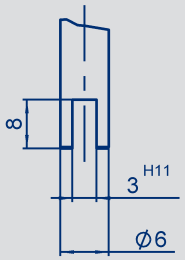
RSM 2801
RSM 2831
RSM 2861

RSM 2802
RSM 2832
RSM 2862

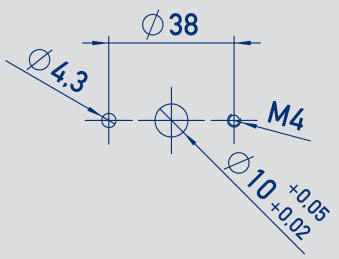
RSM 2821
RSM 2841
RSM 2871

(X) =Wellenmarkierung / shaft marking

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

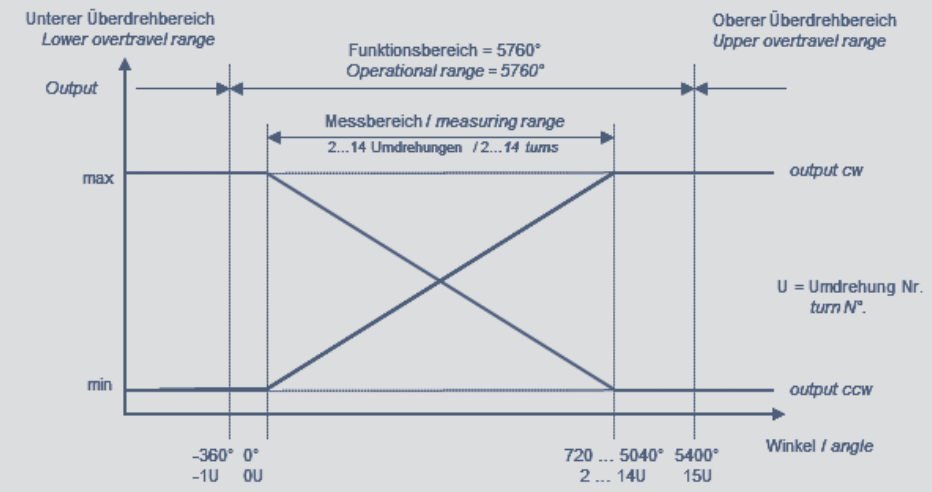


Recommended hole pattern
2 x Ø 4.3 or 2 x M4

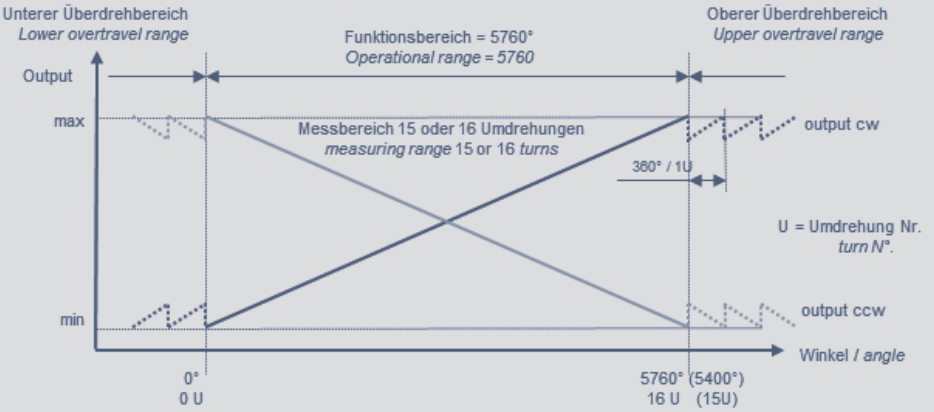


Output Characteristics

Output signals measurement range 2 ... 14 turns



Output signals measurement range 15 ... 16 turns



Technical Data
Analog Versions
- Voltage
- Current

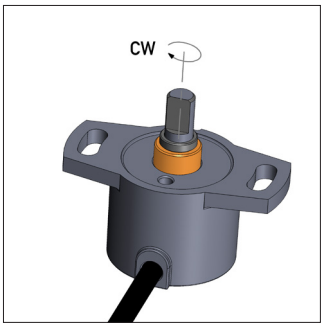
Type Designations	RSM - 28 _ _ - _ _ _ - 2 _ _ - _ _ _ Ratiometric	RSM - 28 _ _ - _ _ _ - 11 _ - _ _ _ Analog voltage	RSM - 28 _ _ - _ _ _ - 12 _ - _ _ _ Analog current	
Electrical Data				
Output signal	ratiometric load ≥ 10 kΩ	0.1 ... 10 V load ≥ 10 kΩ	4 ... 20 mA burden ≤ 500 Ω	
Number of channels	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 Ub	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			MΩ
Cross-section cable	AWG 26, 0.14 (AWG 20, 0.5)*			mm²
Environmental Data				
MTTF (DIN EN ISO 13849-1	175 single	184 single	186	years
parts count method. w/o load)	175 (per channel, at 2 outputs)	184 (per channel, at 2 outputs)		years
Functional safety	If you need assistance in using our products in safety-related systems. please contact us			
EMC compatibility CE	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 Ub	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 characterisitics 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

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

Series

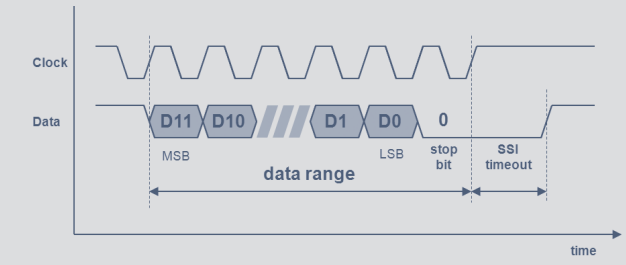
Mechanical version
2801: 6 mm shaft with marking, IP54*
2831: 6 mm,shaft with marking, IP65*
2861: 6 mm shaft with marking, IP67*
2802: 6 mm shaft with flattening, IP54
2832: 6 mm shaft with flattening, IP65
2862: 6 mm shaft with flattening, IP67
2821: push-on coupling, IP54
2841: push-on coupling, IP65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

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

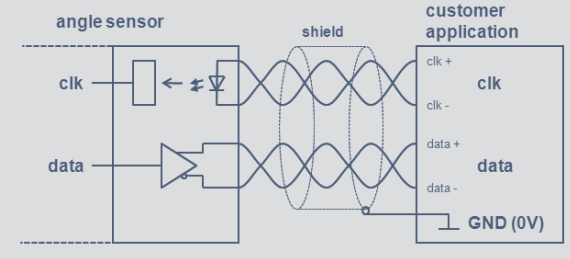
Technical Data
SSI interface

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		mm^2
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 CE	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		

SSI protocol

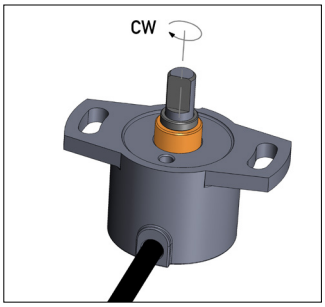


SSI connection



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

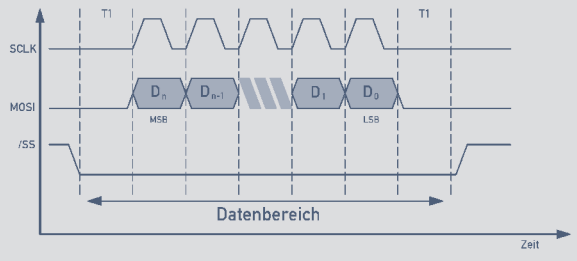
When the shaft marking points towards the cable outlet, the sensor is located on an integer turn position.



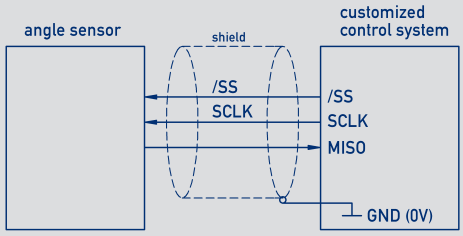
Technical Data
SPI interface

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 16 revolutions: ≤ 0.031	± % FS ± % FS
Repeatability	≤ 0.5	±°
Hysteresis	≤ 1	°
Temperature error	≤ 0.1	± % FS
Supply voltage Ub	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	MΩ
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 CE	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	

SPI protocol

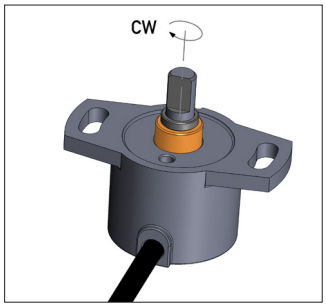


SPI connection



Connection assignment		
Signal	**Cable Code 302**	
Supply voltage Ub	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: 24 V, SSI 16 bit, Gray code, rising cw
42: 24 V, SSI 16 bit, Gray code, rising ccw
43: 24 V, SSI 25 bit (18 bit data), Gray code, rising cw
44: 24 V, SSI 25 bit (18 bit data), Gray code, rising ccw
45: 24 V, SSI 16 bit, binary code, rising cw
46: 24 V, SSI 16 bit, binary code, rising ccw
47: 24 V, SSI 25 bit (18 bit data), binary code, rising cw
48: 24 V, SSI 25 bit (18 bit data), binary code, rising ccw

Interface parameters for SPI Interface
81: 5 V, SPI 16 bit, binary code, rising cw
82: 5 V, 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 = 0.15m, 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

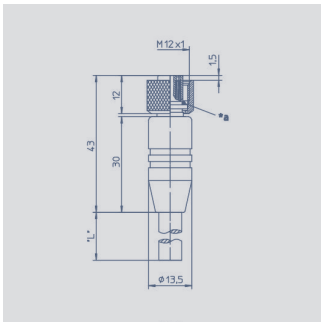
Series

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

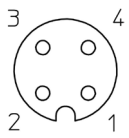
Interface
2: Digital interface

Number of turns for output characteristic
14: 14 turns = 5040°, measuring range controlled
16: 16 turns = 5760°, measuring range not controlled

Accessories
Connector system M12



Pin assignment

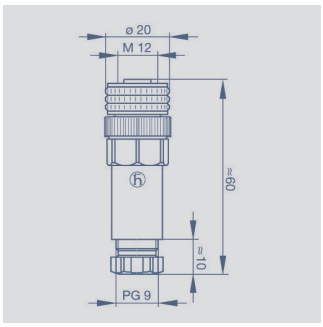


1 = brown
2 = white
3 = blue
4 = black

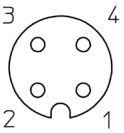
M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, shielded, IP67, open ended

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 mm²

Length	Type	P/N
2 m	EEM 33-32	005600
5 m	EEM 33-62	005609
10 m	EEM 33-97	005650



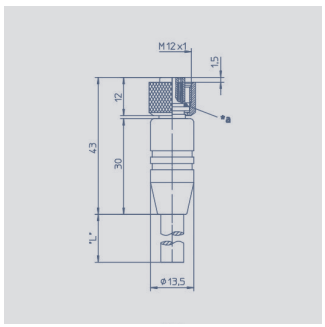
Pin assignment



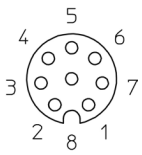
M12x1 Mating female connector, 4-pin, straight, A-coded, with coupling nut, screw termination, IP67, not shielded

Connector housing	Plastic PBT -25 °C...+90 °C
For wire gauge	6...8 mm, max. 0.75 mm²

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 mm²

Length	Type	P/N
2 m	EEM 33-86	005629
5 m	EEM 33-90	005635
10 m	EEM 33-92	005637

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Multifunctional Measuring Device with Display Series MAP-4000

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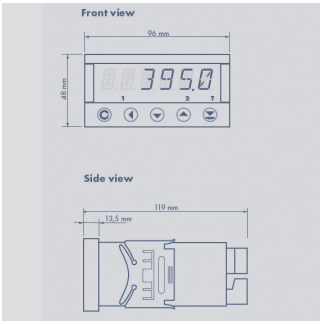

Special features

- Supply voltage 10 ... 30 VDC, 80 ... 250 V DC or AC
- high accuracy
- direct connection of potentiometric and standardized signals
- adjustable supply voltage for sensoren 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

Series

Supply voltage Ub
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

Data storage (only with interface)
0: not storage
1: RTC storage
2: FAST storage

Display colour
1: red