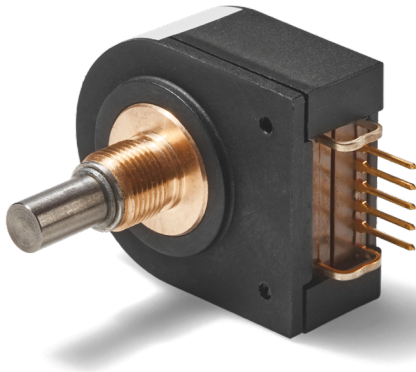


Data Sheet for Angle Sensors

Optical Encoders

Series SPM (SPNTM)



- Up to 1024 pulses / 360°
- 2 channels + index pulse
- Outputs TTL-compatible or as option linedriver
- Supply voltage 5 VDC
- Fast and simple to install, less than 19mm installation depth
- Upper limit frequency 100 kHz

The series SPM is available with higher operational torque (manual feeling) together with IP 55M/IP66S protection grade from shaft side. Thus SPM is especially suitable as panel encoder for manual settings.

In comparison to series SPM the series SPNTM offers a low operational torque with IP40 protection grade from shaft side. SPNTM is primary made for sensor applications.

Electrical Data	SPM / SPNTM	
Number of pulses	50, 96, 100, 200, 256, 360, 400, 500, 512, 1000, 1024 Imp./Rev.	
Output channels	A, B, Z (Z not available for 96 Imp./Rev. and 1024 Imp./Rev.)	
Output electronics	TTL or as an option linedriver	
Supply voltage	5 VDC +/-10 %	
Current consumption (no load)	2 channels A/B typ. 17 mA	3 channels A/B/Z typ. 57 mA
Output voltage High @ IOH	Min. 2.4 V (2 channels A/B: IOH = -40 µA max., 3 channels A/B/Z: IOH = -200 µA max.)	
Output voltage Low @ IOL	Max. 0.4 V (2 channels A/B: IOL = 3,2 mA, IOL 3 channels 3,86 mA)	
Max. output current per channel	5 mA	
Limit frequency	100 kHz	

Mechanical and Environment Data	SPM	SPNTM
Max. operational speed	100 rpm (<1 min. 800 rpm)	
Operational torque	$0.3 \leq M_d \leq 1.3 \text{ Ncm}$ (@ RT/ ca. 4 U/ min bzw. ca. 25°/s)	$0.1 \leq M_d \leq 0.6 \text{ Ncm}$ (@ RT/ ca. 4 U/ min bzw. ca. 25°/s)
Max. allowed axial load	1 N	
Max. allowed radial load	1 N	
Life time shaft bearing 1.)	> 100 Mio. shaft rotating movements	
Fastening torque mounting nut	≤ 5 Nm	
Protection grade front side (IEC 60529)	IP55M, IP66S (IP protection grade is ensured until 200 000 shaft movements)	IP40 (IP protection grade is ensured until 100 Mio. shaft rotating movements)
Protection grade rear side (without solder or clamping terminals)	IP40	
Operating temperature range	-40..+85 °C	
Storage temperature range	-40..+100 °C	
Shaft bearing	Sleeve bearing	
Material housing	Thermoplastic / bronze	
Material shaft	Stainless steel	
Material encoder disc	Thermoplastic	
Mass (product without option N or ST)	app. 25 g	

Data Sheet for Angle Sensors

Optical Encoders

Series SPM (SPNTM)

Mechanical and Environment Data

Vibration proof (IEC 68-2-6, Test Fc)	±1,5 mm / 20 g / 10 bis 2000 Hz / 16 frequency cycles (3 x 4 h)
Shock proof (IEC 68-27, Test Ea)	50 g / 11 ms / half-sine (3 x 6 shocks)
Humidity	90 % RF no dewing
Fastening parts included in delivery	Hex nut AF14, tooth washer

1.) Determined by climatic conditions according to IEC 68-1, para. 5.3.1 without load collectives

Data Sheet for Angle Sensors

Optical Encoders

Series SPM (SPNTM)

Order Code

Description Series SPM, SPNTM	Selection: standard=black/bold, possible options=grey/cursive					
SPM: Operational torque $0.3 \leq Md \leq 1.3$ Ncm (manual feeling), protection class from shaft side IP66S, IP55M	SPM					
SPNTM: Operational torque $0.1 \leq Md \leq 0.6$ Ncm (smooth feeling), protection class from shaft side IP40	SPNTM					
Shaft diameter, shaft length: Shaft diameter $\varnothing 6$ mm, shaft length 20.3 mm Option: user defined shaft [mm] $\varnothing \leq 6,35$ mm		6x20,3 XxXX				
Pulses per revolution / number of channels 1.) The number of pulses and the number of channels are not variable, they are coupled together. BZ: means 3 channels A, B, Z B: means 2 channels A, B Option: 50 pulses, BZ=3 channels 2.) Option: 96 pulses, B=2 channels 2.) Option: 100 pulses, BZ=3 channels 2.) Option: 200 pulses, BZ=3 channels 2.) Option: 256 pulses, BZ=3 channels 2.) 360 pulses, BZ=3 channels Option: 400 pulses, BZ=3 channels 2.) 500 pulses, BZ=3 channels Option: 512 pulses, BZ=3 channels 2.) 1000 pulses, BZ=3 channels Option: 1024 pulses, B=2 channels 2.)						
Supply voltage: VSUP: 5 V (+/- 10 %)				5		
Output signal: TTL Option: Linedriver 2.)						TTL N
Electrical connection: Contact pin's Option: 5 pol. socket (für 5 pol. connector with latch)						- ST

- Option BZ = 3 Channels: Track A, Track B, Track Z (One index impulse per 360° rotation)
Option B = 2 Channels: Track A, Track B, without index impulse
The number of pulses per revolution and the possible number of channels can not be chosen arbitrarily.
For example it is not possible to get the optical resolution 1024ppr together with index track Z.
- This option is only available with minimum order quantity

Order example:

Requirement:

Operational torque requirement with manual feeling (increased torque) - for example for usage in a panel encoder application, shaft diameter $\varnothing 6.00$ mm, optical resolution 512 ppr., 3 channels (A/B with Index), supply voltage 5 V, electrical output: TTL, electrical connection: contact pin's

Example for order code:

SPM 6x20,3 0512 BZ 5 TTL

Data Sheet for Angle Sensors

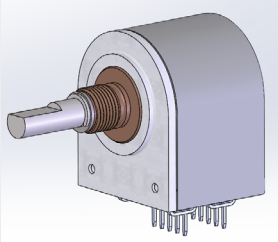
Optical Encoders

Series SPM (SPNTM)

For higher quantities or on-going demand, additional options are available as described below on request

For example:

- Other pulses per revolution: 1250 / 2000 / 2048 / 2500 / 4000 / 4096 / 5000
- Tandem version with 2 independent optical discs and 2 optical modules, also with different numbers of pulses, shaft flattening



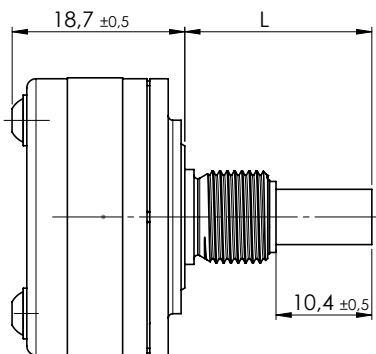
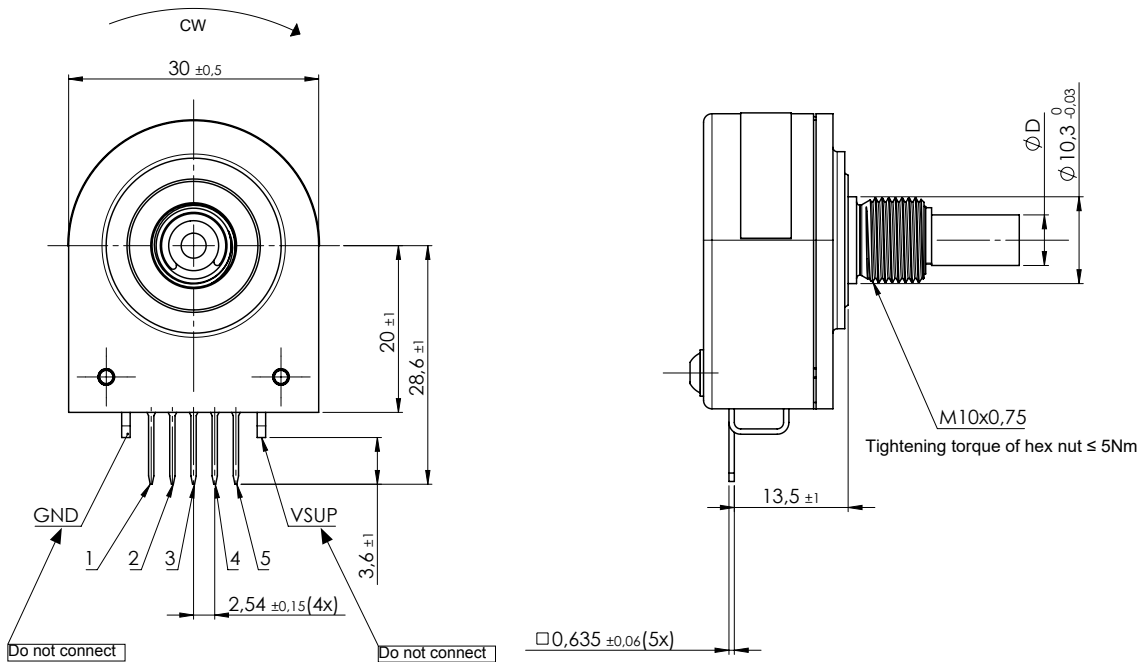
- Ball bearing instead of sleeve bearing
- Special shaft design. For example: change of shaft length, special shaft flattening, shaft diameters $\leq 6,35\text{mm}$
- Other operational torque
- Special cable and connection design

Data Sheet for Angle Sensors

Optical Encoders

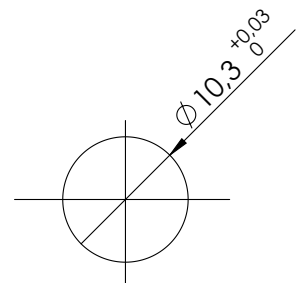
Series SPM (SPNTM)

Drawing

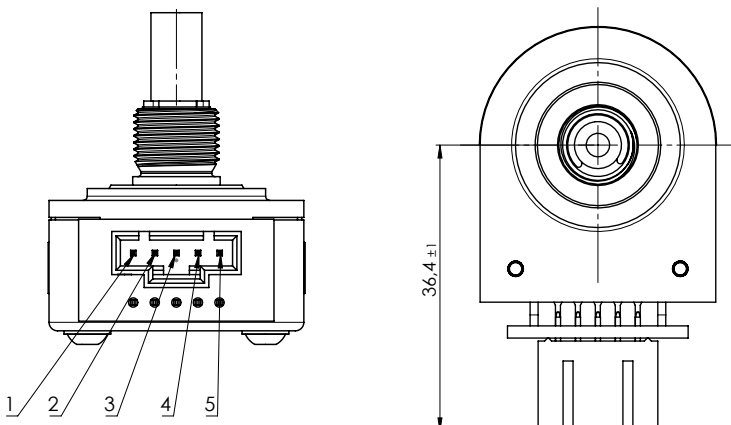


Standard shaft dimensions	
Shaft length L	20,3 mm
Shaft diameter D	6 mm

Recommended Drilling Pattern:



Option ST



Data Sheet for Angle Sensors

Optical Encoders

Series SPM (SPNTM)



Sufficient ESD protection is necessary for the transport, assembly and operation of the encoder.

PIN Assignment Series SPM, SPNTM

PIN	Option B (2 Channels)	Option BZ (3 Channels)
PIN 1	GND	GND
PIN 2	Do not connect !	Channel Z (Index)
PIN 3	Channel A	Channel A
PIN 4	VSUP	VSUP
PIN 5	Channel B	Channel B

Recommendations for mating connectors:

Standard, contact pins (TTL output):

MOLEX: KK 254 crimp housing, 5 circuits, series 2695
 KK254 crimp terminals series 2759

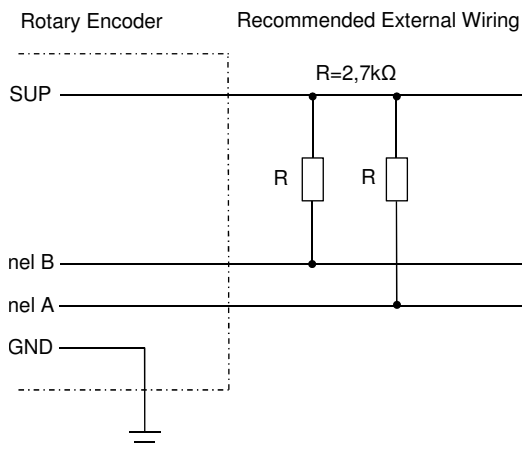
For Option ST (with plug and TTL output):

MOLEX: SL crimp housing, 5 circuits, series 70066
 SL crimp terminals series 70058

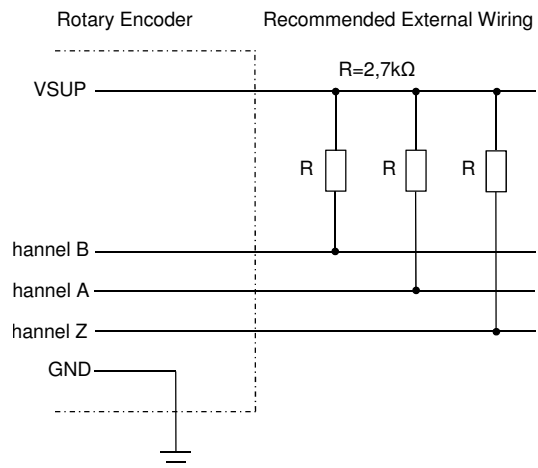
For Option N (with plug and linedriver output):

MOLEX: SL housing, 8 circuits, series 70066
 SL crimp terminals series 70058

Recommended Output Circuit TTL (2 Channels)



Recommended Output Circuit TTL (3 Channels)

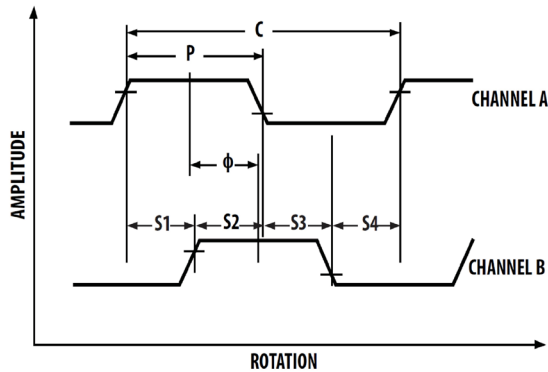


Data Sheet for Angle Sensors

Optical Encoders

Series SPM (SPNTM)

Output Signals TTL (2 Channels) Sense of Rotation: CW (Clockwise)



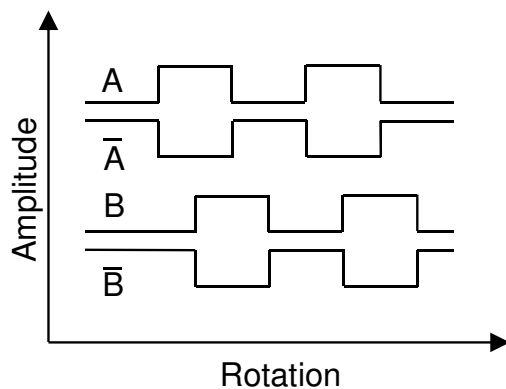
Possible Output Signal Deviations (2 Channels)

$$S1, S2, S3, S4 = \frac{C}{4} \pm \frac{C}{12}$$

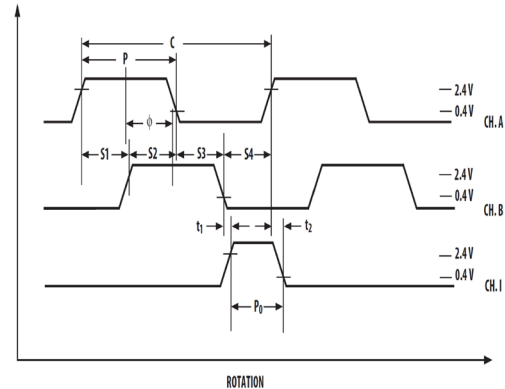
$$P = \frac{C}{2} \pm \frac{C}{12}$$

$$\Phi = \frac{C}{4} \pm \frac{C}{24}$$

Output Signals Linedriver (2 Channels) Sense of Rotation: CW (Clockwise)



Output Signals TTL (3 Channels) Sense of Rotation: CW (Clockwise)



Possible Output Signal Deviations (3 Channels)

$$S1, S2, S3, S4 = \frac{C}{4} \pm \frac{C}{12}$$

$$P = \frac{C}{2} \pm \frac{C}{12}$$

$$\Phi = \frac{C}{4} \pm \frac{C}{24}$$

$$P_0 = \frac{C}{4} \pm \frac{C}{12}$$

Output Signals Linedriver (3 Channels) Sense of Rotation: CW (Clockwise)

