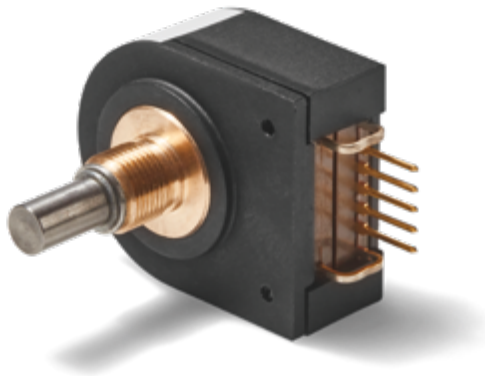


Data Sheet for Angle Sensors

Optical Encoders

Series SPM



- Up to 1024 pulses / 360°
- 2 channels + index pulse
- Supply voltage 5 VDC / Outputs TTL-compatible
- Lifetime 100 mio. shaft revolutions
- Fast and simple to install, less than 19 mm installation depth
- High-quality feel

The SPM series is characterized by its reliability and long service life of more than 100 million shaft movements. Specially designed for use as a manual input element, the standard high torque provides a high-quality operating feel and enables precise setpoint setting. When not used as panel encoder, the NT low torque option is available.

Electrical Data

Number of pulses	100, 256, 360, 400, 500, 512, 1000, 1024 ppr.	
Output channels	A, B, Z (Z not available for 1024 ppr.)	
Output electronics	TTL	
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

Max. operational speed	100 rpm (<1 min. 800 rpm)	
Operational torque	Standard: 0.3 ≤ Md ≤ 1.3 Ncm (@ RT/ ca. 4 U/min resp. ca. 25°/s)	Option NT: 0.1 ≤ Md ≤ 0.6 Ncm (@ RT/ ca. 4 U/min resp.. ca. 25°/s)
Max. allowed axial load	1 N	
Max. allowed radial load	1 N	
Life time shaft bearing 1.)	> 100 Mio. shaft rotations	
Fastening torque mounting nut	≤ 5 Nm	
Protection grade front side (IEC 60529)	Standard: IP55M, IP66S (IP protection grade is ensured until 200 000 movements)	Option NT: IP40 (IP protection grade is ensured until 100 Mio. movements)
Protection grade rear side (without solder or clamping terminals)	IP40	
Operating temperature range	-20 °C up to +60 °C (other temperatures on request)	
Storage temperature range	-40 °C up to +100 °C	
Shaft bearing	Sleeve bearing	
Material housing	Thermoplastic / bronze	
Material shaft	Stainless steel	
Material encoder disc	Thermoplastic	
Mass (product without or ST)	app. 25 g	

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

Order Code							
Description	Selection: standard=black/bold , possible <i>options=grey/italic</i>						
Series	SPM						
Shaft diameter, shaft length: Shaft diameter Ø6 mm, shaft length 20.3 mm <i>User-defined shaft [mm] Ø≤6.35 mm</i>		6x20,3 <i>XxXX</i>					
Pulses per revolution:							
100			0100				
256			0256				
360			0360				
400			0400				
500			0500				
512			0512				
1000			1000				
1024 (only with track A+B, no index) <i>Customized pulse per revolution (linked to MOQ)</i>			1024 <i>XXXX</i>		(B)		
Supply voltage: VSUP: 5 V (+/- 10 %)				5			
Output signals: 3 channels: track A, track B, track Z (index pulse 1x per 360° revolution) <i>2 channels: track A, track B, no index</i>					BZ <i>B</i>		
Output electronics: TTL						TTL	
Operational Torque: Standard $0.3 \leq Md \leq 1.3$ Ncm (shaft sealing IP66S/IP55M) <i>Reduced torque $0.1 \leq Md \leq 0.6$ Ncm (shaft sealing IP40)</i>							- <i>NT</i>
Electrical connection: Contact pins <i>5-pole socket (for 5 pol. connector with latch)</i>							- <i>ST</i>

Order example:

Requirement:

Operational torque requirement with manual feeling (increased torque) - for example for usage in a panel encoder application, shaft diameter Ø6.00 mm, optical resolution 512 ppr., 3 channels (A/B with Index), supply voltage 5 V, electrical output: TTL, electrical connection: contact pins

Example for order code:

SPM 6x20,3 0512 BZ 5 TTL

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

For example:

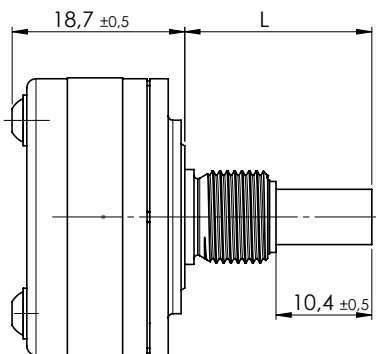
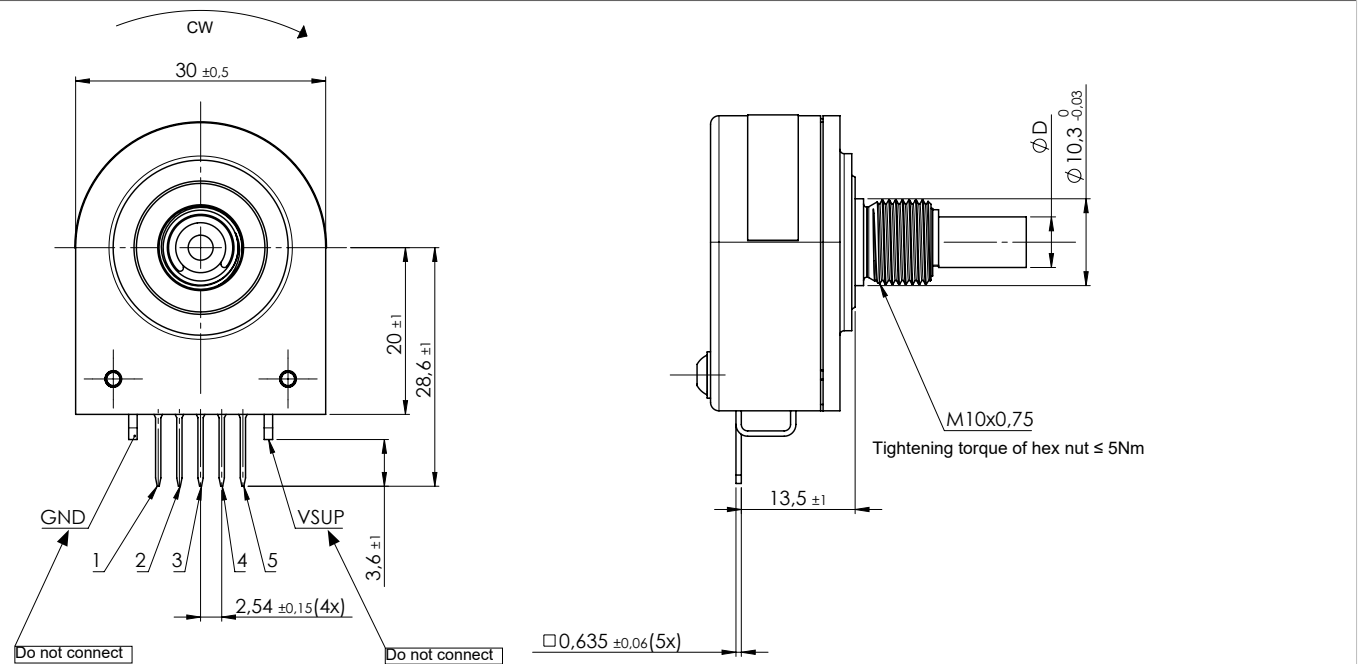
- Tandem version with 2 independent optical discs and 2 optical modules, also with different numbers of pulses
- Ball bearing instead of sleeve bearing
- Special shaft design. For example: change of shaft length, special shaft flattening, shaft diameters ≤ 6.35mm
- Other operational torque
- Special cable and connection design
- Line driver outputs

Data Sheet for Angle Sensors

Optical Encoders

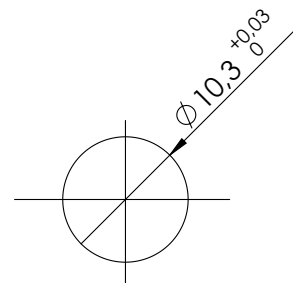
Series SPM

Drawing

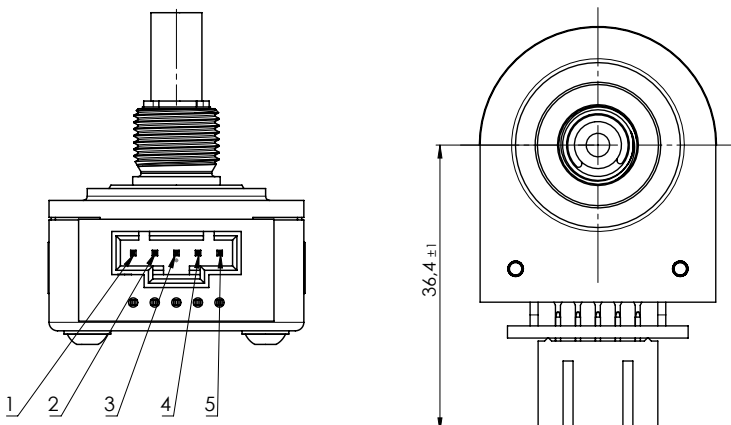


Standard shaft dimensions	
Shaft length L	20,3 mm
Shaft diameter D	6 mm

Recommended Drilling Pattern:



Option ST



Data Sheet for Angle Sensors

Optical Encoders

Series SPM



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

PIN Assignment

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

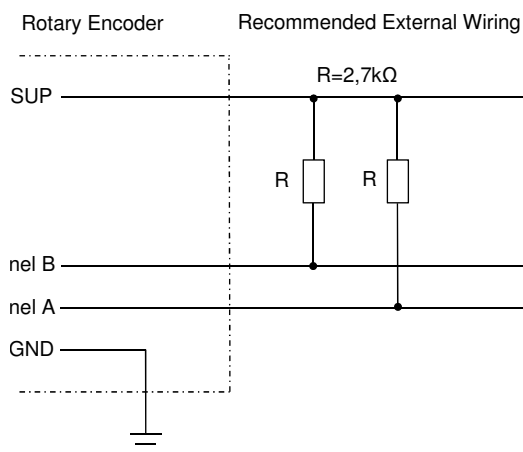
For Option ST (with plug and TTL output):

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

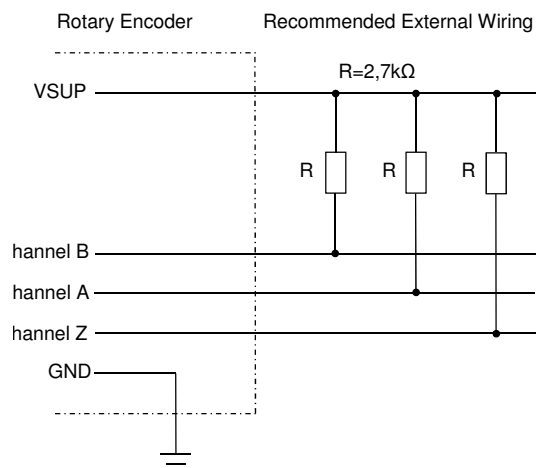
For Option N (with plug and linedriver output):

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

Recommended Output Circuit TTL (2 Channels)



Recommended Output Circuit TTL (3 Channels)

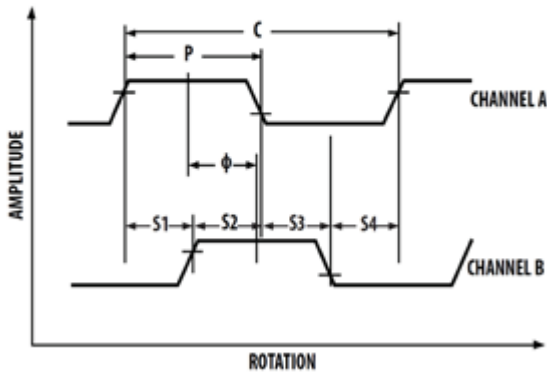


Data Sheet for Angle Sensors

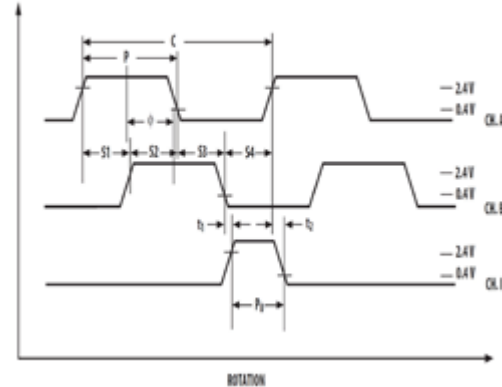
Optical Encoders

Series SPM

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



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



Possible Output Signal Deviations
(2 Channels)

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

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

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

Possible Output Signal Deviations
(3 Channels)

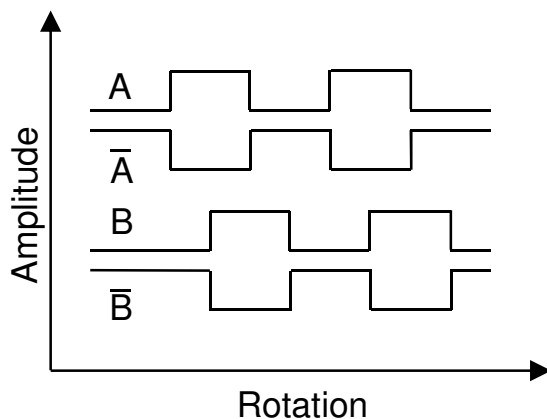
$$S1, S2, S3, S4 = \frac{C}{4} \pm \frac{C}{12}$$

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

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

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

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



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

